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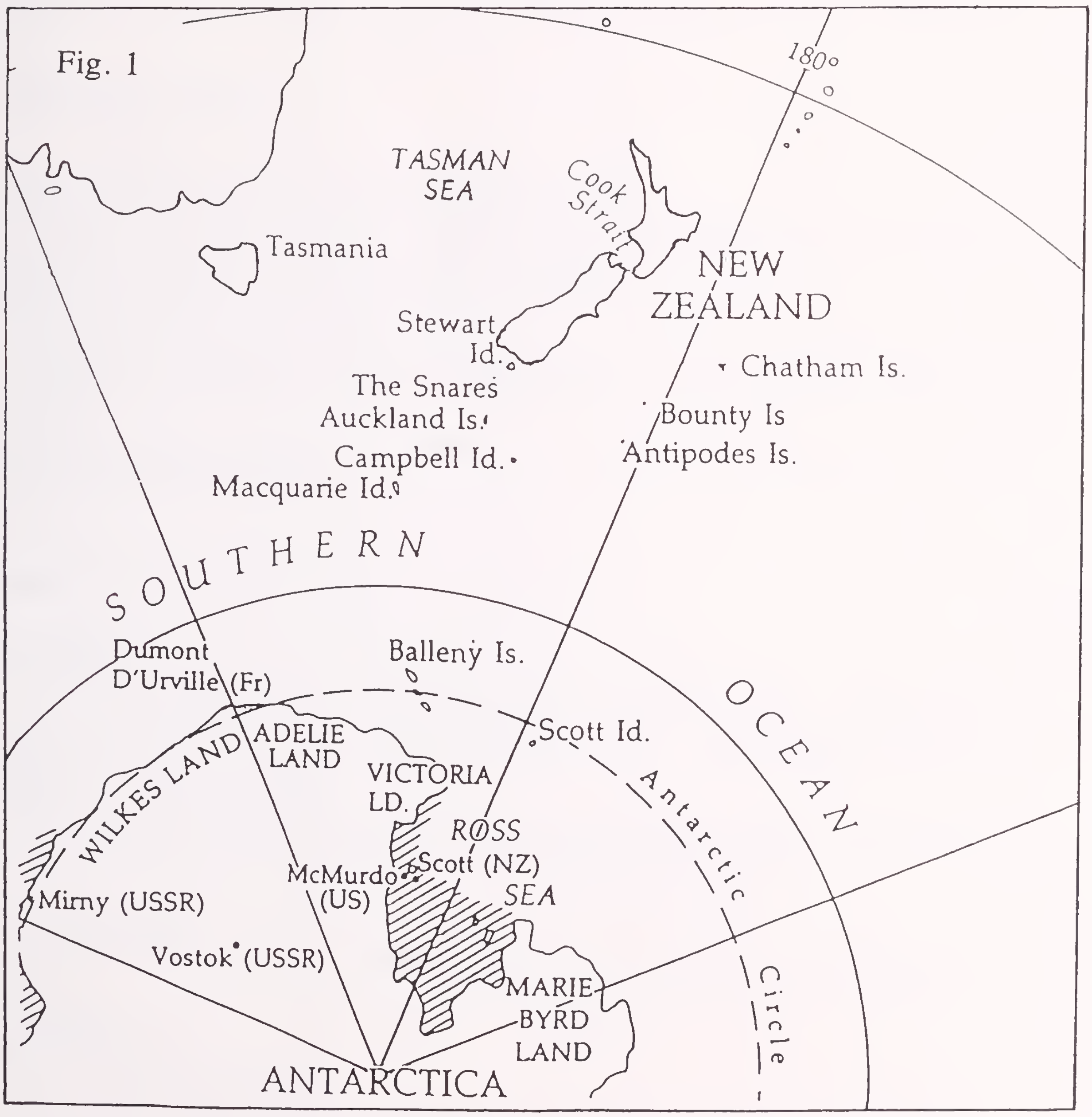
MARINE MOLLUSCS OF THE AUCKLAND AND CAMPBELL ISLANDS, SOUTHERN NEW ZEALAND, JANUARY 1993

by Margaret S. Morley

SUMMARY

A total of 121 species of marine molluscs, including micromolluscs are recorded from the Auckland and Campbell Islands in the Subantarctic. This paper reports an extension of range for 3 chitons, 19 gastropods and 8 bivalves. A list of species found at 15 locations is included. Representative specimens are housed in the Auckland Institute and Museum.

SUBANTARCTIC ISLANDS OF NEW ZEALAND AND AUSTRALIA



INTRODUCTION

A survey of molluscs on Auckland, Campbell and the Snares Islands, (Fig.1) was undertaken from the 26th January to 2nd February 1993 on a Southern Heritage Expedition cruise ship the MV "Pacific Ruby". An intertidal search was done at every landing place. Snorkelling was possible at only four locations.

Time did not permit searches in fresh water.

Unfortunately the hull shape of the "Pacific Ruby" made it impossible to collect anchor mud. This had proved a rich source of molluscs during a Stewart Island trip on the MV "Acheron". Future study of dredged material would be valuable especially for micromollusca.

Since a lot of time was spent at sea, eleven days were not enough. Even when ashore, I wanted to be in two or three places simultaneously to cover all the collecting possibilities!

"New Zealand Mollusca" Powell (1979) has been used as a reference when commenting on extension of range for molluscs found. Nomenclature follows (Powell, 1979) except where updating is required. See "Name Changes" with Species List.

INTERTIDAL ZONE

The intertidal zone in harbours was ill-defined because:

1. Rise and fall of the tide is approximately 1 metre;
2. There is continuous fresh water seepage across the beaches from the bush margins. It rains on average over three hundred days per year;
3. The intertidal zone is seldom exposed to desiccation because there is cloud cover for approximately 80% of the possible time.
4. Beaches on Auckland Island are often shaded by Southern Rata *Metrosideros umbellata.*
5. Large amounts of algae were washed up. This remained wet and decomposing, merging with the leaf litter.

METHODS OF COLLECTING

A. Snorkel

A wet suit, weight belt and snorkel were used, but not S.C.U.B.A.. This permitted searching to a depth of 3 metres and out from the shore 100 metres. Dive time was about 30 minutes, limited by water temperatures of 8 - 11°C (and the thought of changing in wind and sleet!).

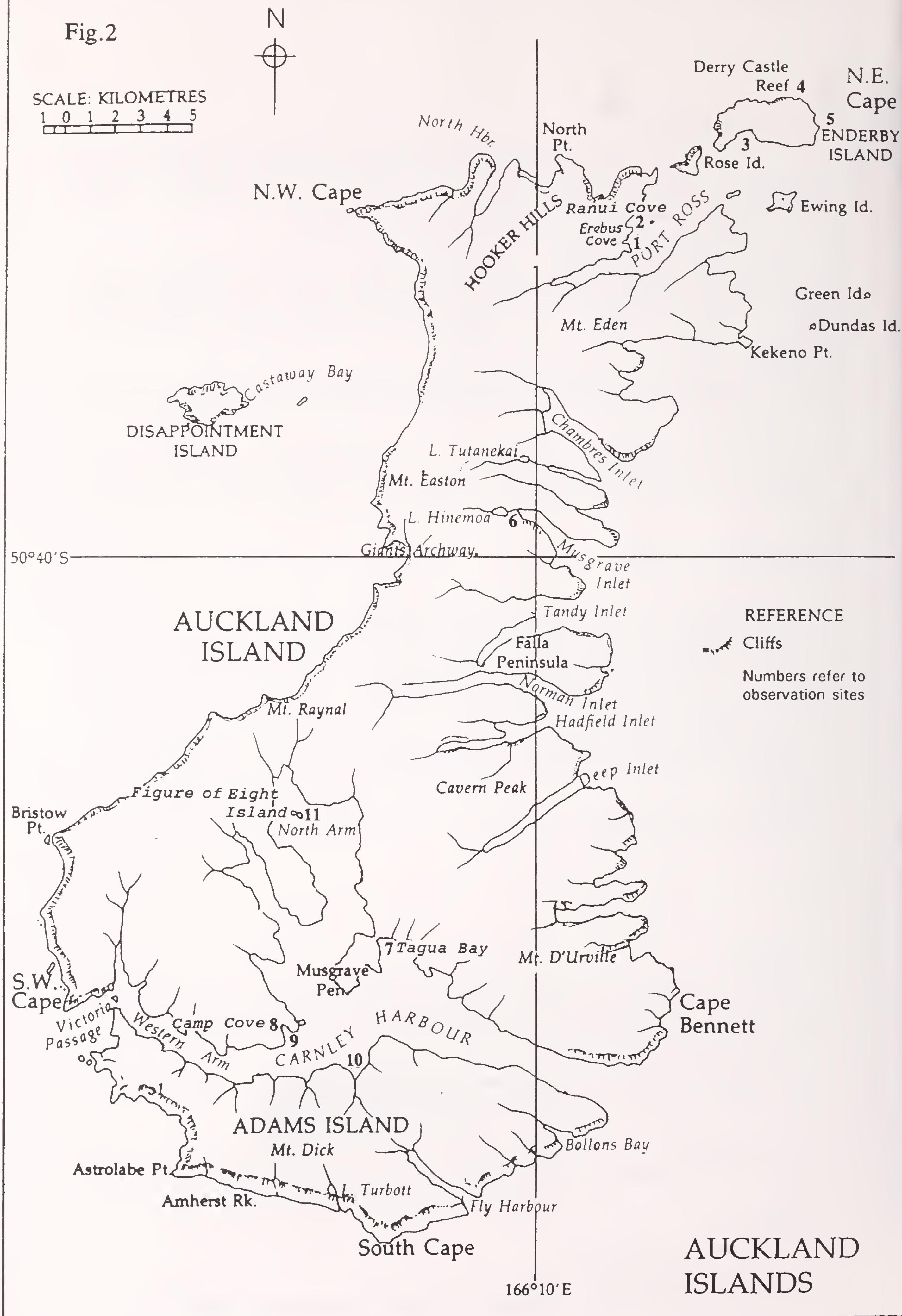
Shell sand was collected from below low tide and under rocks. Algae were also taken. Snorkel sites were restricted to relatively sheltered harbours.

B. Intertidal Sites

All shore levels from the highest splash zone to low water were examined for molluscs:

1. Washed up;
2. Sieved from mud and sand;
3. Alive on or under rocks;
4. Rock wash. Smaller rocks were shaken vigorously under water in a plastic bag;

Fig.2


N
SCALE: KILOMETRES
1 0 1 2 3 4 5
North Hbr.
N.W. Cape
North Pt.
HOOKER HILLS
Ranui Cove
Erebus Cove
PORT ROSS
Derry Castle Reef 4
N.E. Cape
5
ENDERBY ISLAND
3
Rose Id.
Ewing Id.
Green Id.
Dundas Id.
Mt. Eden
Kekeno Pt.
Castaway Bay
DISAPPOINTMENT ISLAND
Chambres Inlet
L. Tutanekai
Mt. Easton
L. Hinemoa
6
Giants Archway
50°40′S
Musgrave Inlet
Tandy Inlet
AUCKLAND ISLAND
Falla Peninsula
REFERENCE
Cliffs
Numbers refer to observation sites
Norman Inlet
Mt. Raynal
Hadfield Inlet
Deep Inlet
Cavern Peak
Figure of Eight Island
11
North Arm
Bristow Pt.
7 Tagua Bay
Mt. D'Urville
Musgrave Pen.
S.W. Cape
Victoria Passage
Western Arm
Camp Cove 8
9
HARBOUR
CARNLEY
10
Cape Bennett
ADAMS ISLAND
Mt. Dick
Bollons Bay
Astrolabe Pt.
L. Turbott
Amherst Rk.
Fly Harbour
South Cape
166°10′E
AUCKLAND ISLANDS

5. Substrate from under rocks.
6. Algal wash. The algae, including the holdfasts, were soaked in fresh water plus a few drops of formalin preservative.
7. Shells used by hermit crabs.
8. Holdfasts washed up.
9. Shell sand washed up at all beach levels.

All mollusca, algae and sediment taken were washed, sieved with a 0.5 mm sieve, dried, and later examined under a microscope. This method produced a few surprises, such as *Tubbreva exultata exultata, Eatoniella smithi* and *Lissarca aucklandica* living on the back of the large chiton *Plaxiphora aurata*.

CURATING

Curating and labelling on board the "Pacific Ruby" was a mighty challenge, being done late at night, often with the ship under way and rolling. The "laboratory" consisted of a narrow gangway sodden with the day's wet weather gear and muddy boots. It was a wonder there were no mishaps as crew and passengers stepped over me, my specimens, containers and bottles of preservative! One engineer took a keen interest, being particularly intrigued by my more bizarre antics such as washing seaweed!

OBSERVATION SITES: AUCKLAND ISLANDS (Fig. 2)

1. Erebus Cove Snorkel, Auckland Island
The large limpet *Cellana strigilis strigilis* was common from mid to low tide as was *Notoacmea pileopsis sturnus* on high tidal rocks. Numerous plum-coloured top shells *Cantharidus capillaceus capillaceus* were on all species of algae and on low tidal rocks. At the same level were many small, brightly coloured *Margarella antipoda antipoda*. Some of these live shells collapsed when picked up, possibly dissolved by acid water from the peaty streams.

Below low tide, at a depth of 1 - 3 metres were three or four bright pink *Thoristella chathamensis aucklandica*.(Fig. 3) Also on rocks at this depth was the large striped whelk *Buccinulum pertinax pertinax*. The 3-5 mm pink limpet *Actinoleuca campbelli campbelli* was living on *Cantharidus capillaceus capillaceus* although this was not discovered until later microscopic examination. Attached to algae was *Lissarca aucklandica*. (Fig. 4)

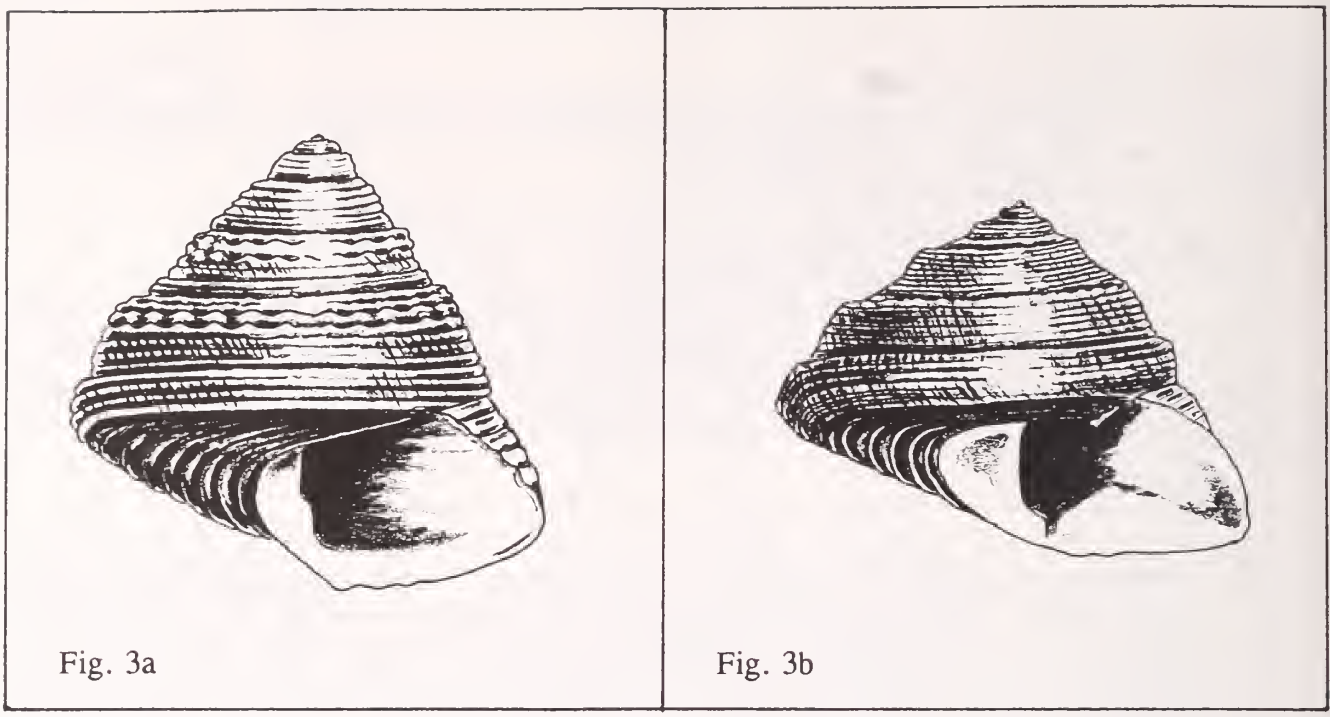


Fig. 3
TROCHIDAE
Thoristella chathamensis aucklandica (E.A.Smith, 1902)

Location: Erebus Cove, Auckland Island. On rocks, depth 2 metres, snorkel.
Date: 26th January 1993.
Description: a) Typical form, Height 8.9mm. Width 7.5mm.
b) Keeled form, Height 5.7mm.Width 8.7mm.
Colour bright pink when alive, yellowish towards the white umbilicus.
Shell variable in height, strength of peripheral keel and presence or absence of subsutural axials. Typical form, tall, conical with straight outlines, flat topped spiral cords and only weak subsutural axial folds.

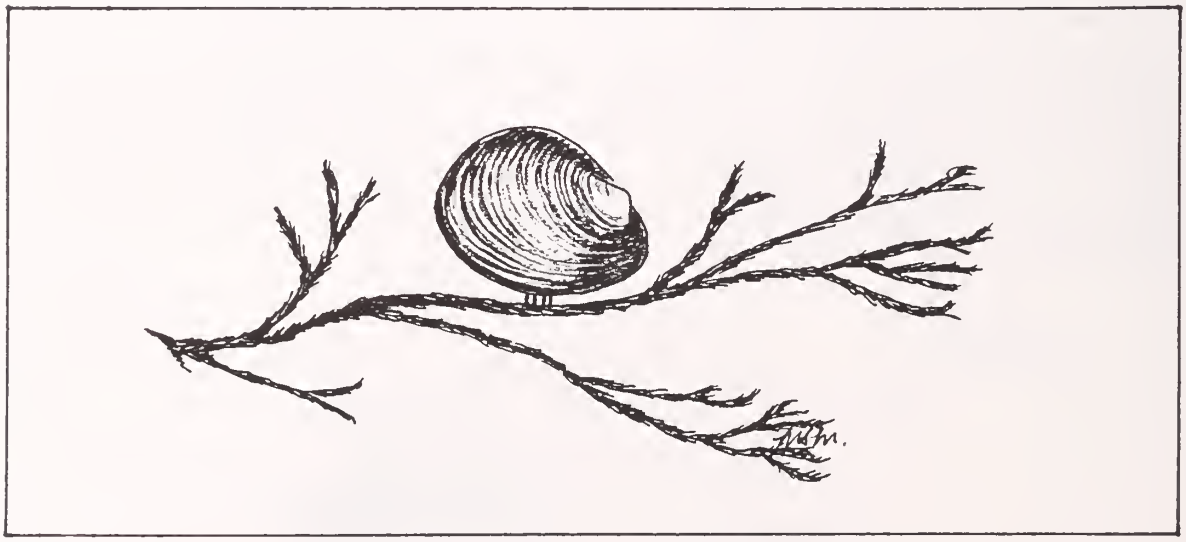


Fig. 4
PHILOBRYIDAE
Lissarca aucklandica E.A.Smith, 1902

Location: Erebus Cove, Auckland Island. Attached by byssus to algae 1 metre below low tide, snorkel.
Date: 26th January 1993
Description: Length 2.5 mm Height 2 mm. Colour dark reddish brown. Sculpture very fine concentric growth lines. Solid, moderately inflated with strongly crenulated margins. Hinge plate narrow and with an anterior and posterior series of teeth. See "New Zealand Mollusca" Powell (1979) P. 368.

6

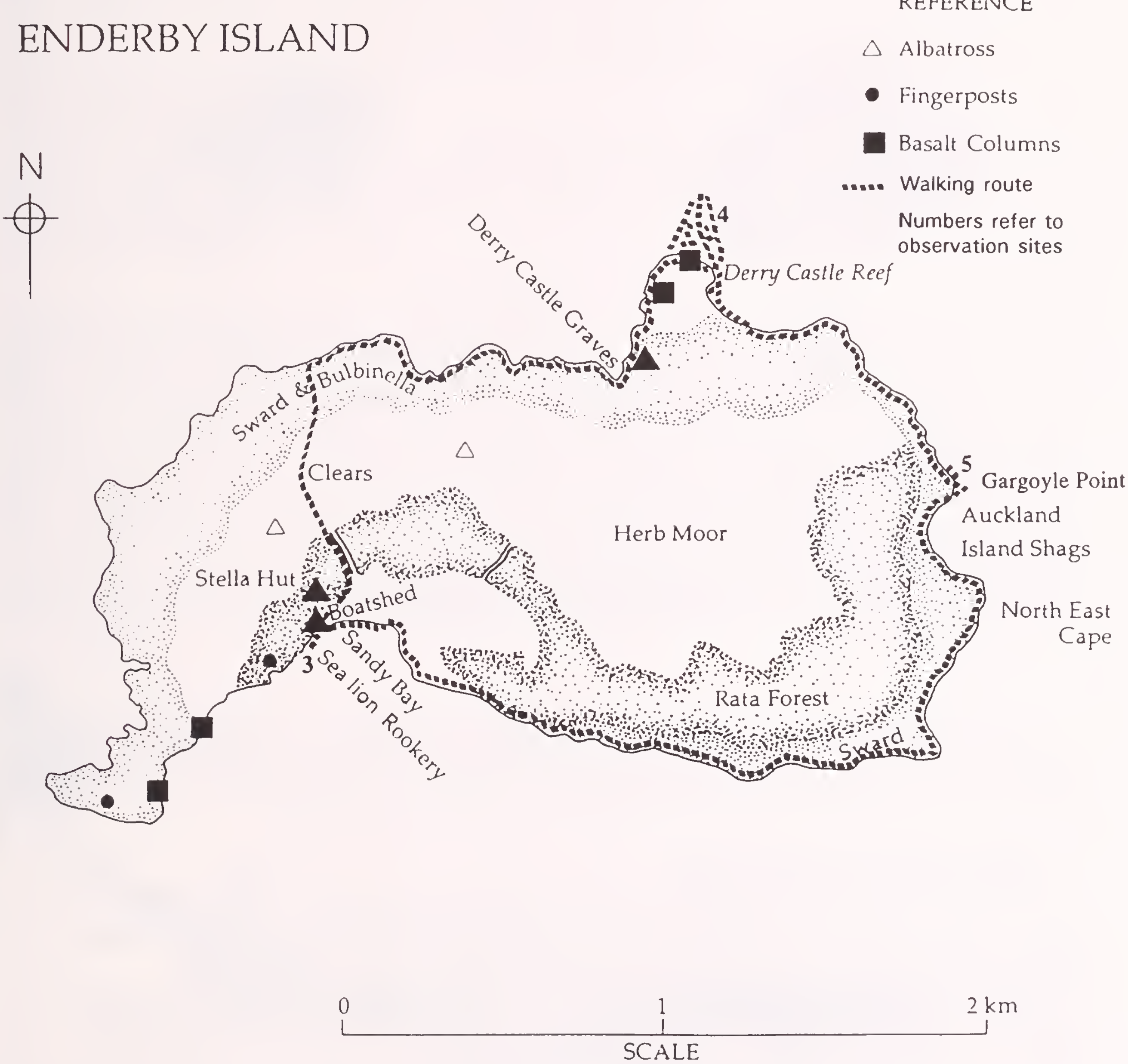
2. Ranui Cove, Auckland Island

A brief high tidal search only. *Cellana strigilis strigilis* and *Margarella antipoda antipoda* were common as at all sites.

3. Sandy Bay, Enderby Island (Fig. 5)

Lepsithais lacunosus was living among short, brown algae on the rocky platform at the western end of the beach.

Fig. 5



4. Derry Castle Reef, Enderby Island

This was by far the richest collecting site of the trip. The relentless, rolling swells smashed against the westerly edge of the extensive basalt reef. Spray was flung high into the air to continue its journey in the wind. The reef area contained many gullies and deep rock pools. An abundance of holdfasts, mainly kelp *Durvillaea antarctica* were thrown ashore, some recent ones still sheltering the original inhabitants, such as the small bivalves *Kidderia costata* and *Hiatella arctica* and the trochid *Margarella antipoda rosea*. The washed up shell sand contained many species of micromolluscs, over a dozen not previously recorded from the Auckland Islands. One of these was the delicately sculptured scissurellid *Sinezona subantarctica* which was previously known only from Macquarie Island. (Fig. 6)

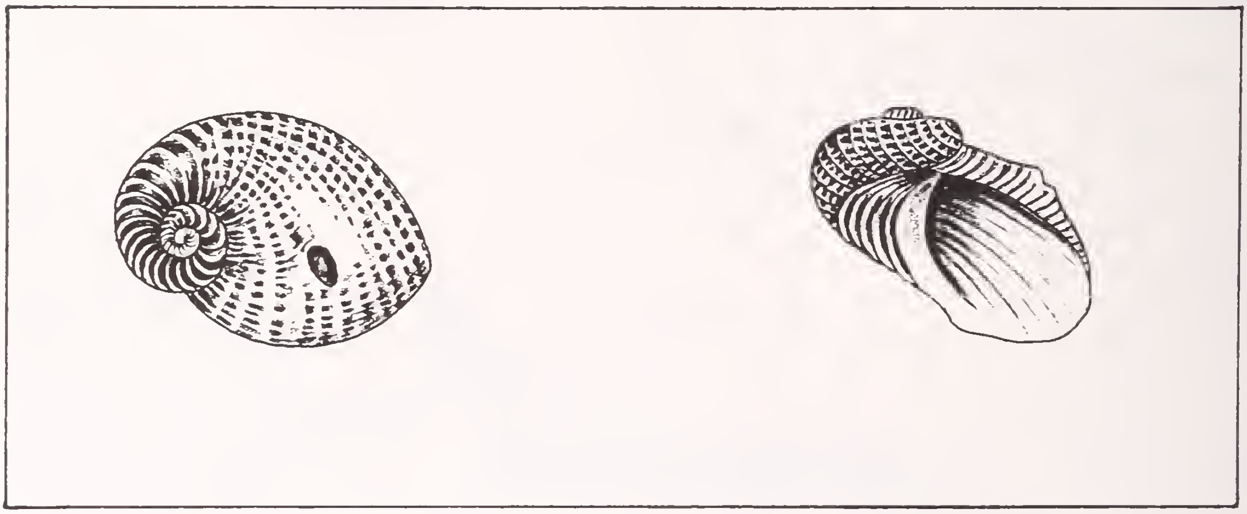


Fig. 6
SCISSURELLIDAE
Sinezona subantarctica (Hedley, 1916)

Location: Derry Castle Reef, Enderby Island. In shell sand.
Date: 27th January 1993
Description: Height 0.5mm. Width 0.9mm. Colour white, shell ovate with rounded, rapidly increasing whorls, a lens shaped foramen without a selenizone. Sculpture of fine, spiral and radial threads.

In shell sand were single valves of the chitons *Notoplax* sp. and *Ischnochiton luteoroseus,* both new records for the Auckland Islands. The paua *Haliotis virginea huttoni* was washed ashore in great numbers, but none was found alive.

5. Gargoyle Point, Enderby Island

Here, several dozen of the large trochid *Calliostoma spectabilis* were washed in with varying degrees of damage. Live specimens must be close to shore. Is the weather ever calm enough to access low tide? Definitely not a snorkelling site!

Sandy Bay with its hundreds of Hooker's sea lions *Phocarctos hookeri,* was a welcome sight indicating the end of a long day. The playful groups of adults and pups gave a lively entertainment whilst I waited for the zodiac.

6. Musgrave Inlet, East Coast, Auckland Island

Collecting before breakfast! There were turnable boulders, but slippery algae and territorial sea lions were a hazard! *Xenostrobus pulex* found security in numbers by packing tightly between rocks and in crevices. *Diloma nigerrima* was feeding on decaying *Durvillaea antarctica*. The washed up valves of *Ruditapes largillierti* were much thicker and heavier than North Island specimens. That breakfast was welcome!

7. Tagua Bay Snorkel, Carnley Harbour, Auckland Island

Carnley Harbour greeted the "Pacific Ruby" with gale force winds. Shelter was found in Tagua Bay.

A snorkel 60 metres out from the beach gave a close look at beds of brown algae *Macrocystis pyrifera* rising to the surface through clear water from the holdfasts 20 metres below. Closer to shore, the rock and gravel were thickly covered in short, brown algae and writhing beds of translucent green *Ulva laingii*.

The crab *Jacquinotia edwardsii* has a carapace in bright shades of red and orange up to 150 mm in width. Many specimens were daintily transferring particles of food to their mouths with their long claws.

The pale buff chiton *Ischnochiton circumvallatus* was crowded under rocks. A few *Plaxiphora aurata* were crawling, exposed on low tidal rocks. Microscopic *Onoba spp.* were common from algal washings. Tagua Bay was the only site where *Volvarinella stewartiana* was found.

8. Camp Cove, Carnley Harbour, Auckland Island

Next day Carnley Harbour was in one of its rare, calm moods. As the morning mist ebbed away, perfect reflections of the rata-covered slopes were revealed. A low tide search was amongst turnable rocks and silty mud. Sieving found juvenile *Ruditapes largillierti* and *Nucula nitidula*. *Buccinulum vitattum littorinoides* and *Paxula subantarctica* were under rocks so were masses of writhing "worms" with a putrid smell. The dark slugs *Onchidella campbelli* were on shaded high tidal rocks. *Pisinna rekohuana rekohuana* showed up later from rock washings and *Eatoniella roseola* and *E. kerguelenensis chiltoni* from algal washes. Living specimens of *Arthritica bifurca* obtained by sieving indicate an extension of range for this species.

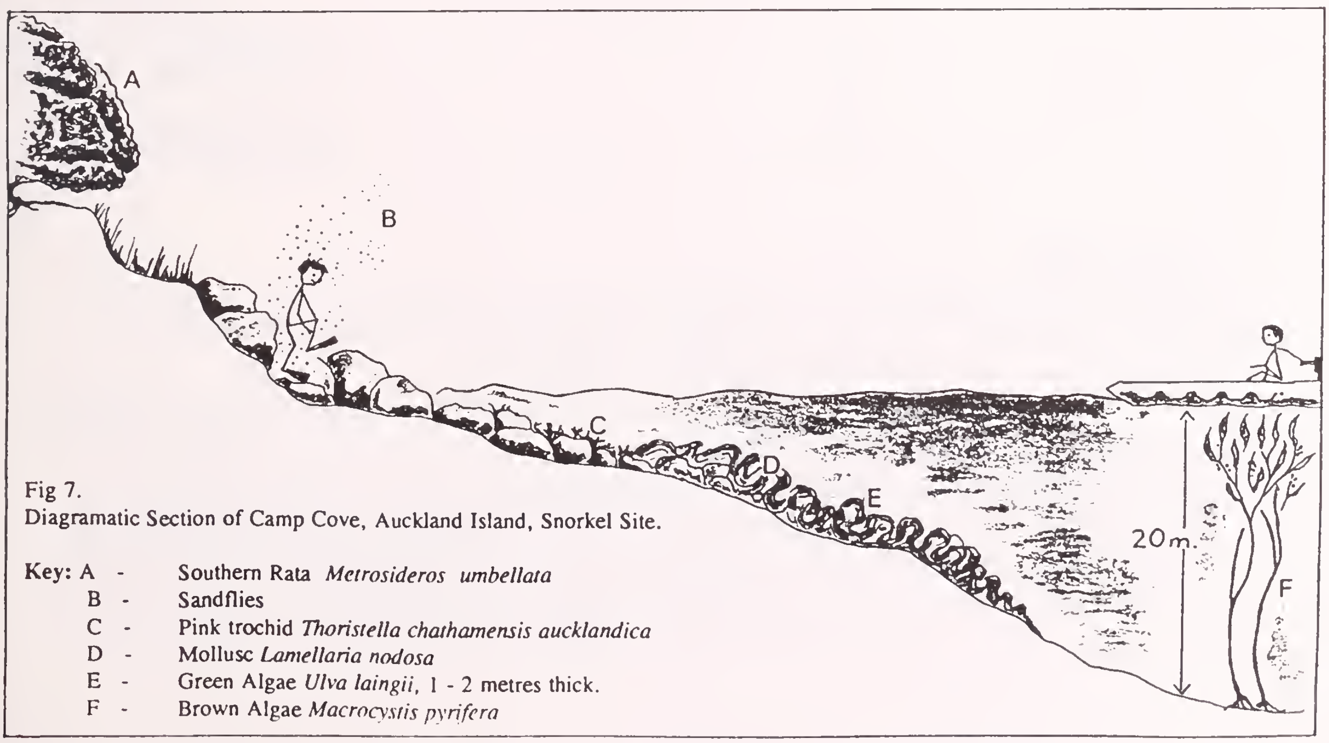


Fig 7.
Diagramatic Section of Camp Cove, Auckland Island, Snorkel Site.

Key: A - Southern Rata *Metrosideros umbellata*
B - Sandflies
C - Pink trochid *Thoristella chathamensis aucklandica*
D - Mollusc *Lamellaria nodosa*
E - Green Algae *Ulva laingii*, 1 - 2 metres thick.
F - Brown Algae *Macrocystis pyrifera*

9. Camp Cove Snorkel

A reef just outside Camp Cove had clearer water for a snorkel. Here I struggled to haul on my wet wet suit while the dense hoard of sand flies took full advantage of my predicament.(Fig. 7) At a depth of two metres, a few *Xymene aucklandica* gleamed bright pink in the sunlight. Two white mollusca *Lamellaria nodosa* (Fig. 8) were attached to the underside of *Ulva laingii* fronds.

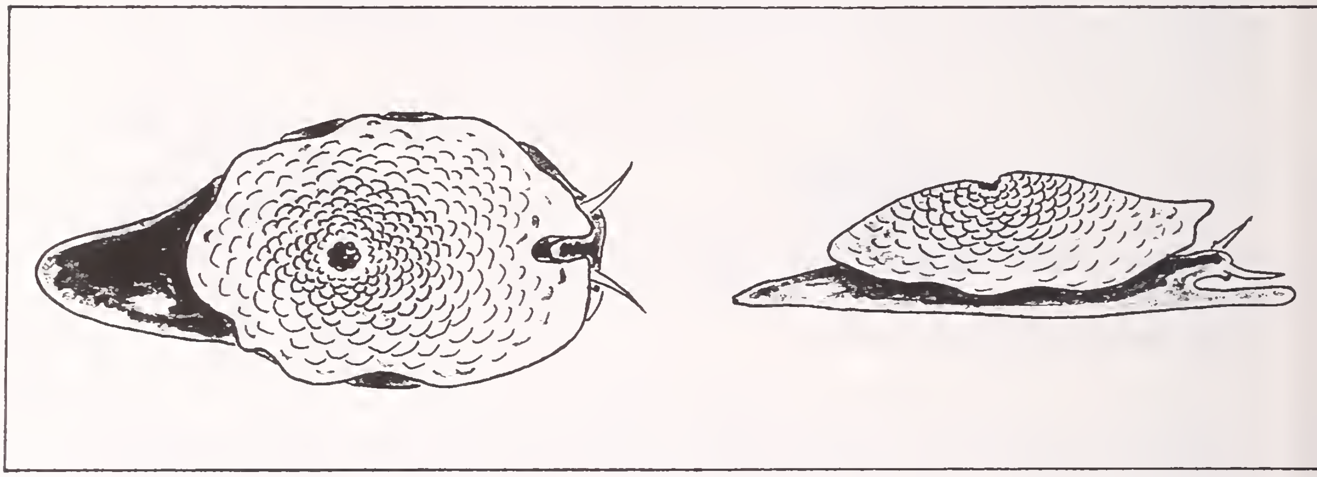


Fig. 8
VELUTINIDAE Lamellariinae
Lamellaria nodosa E.V.Marcus, 1987

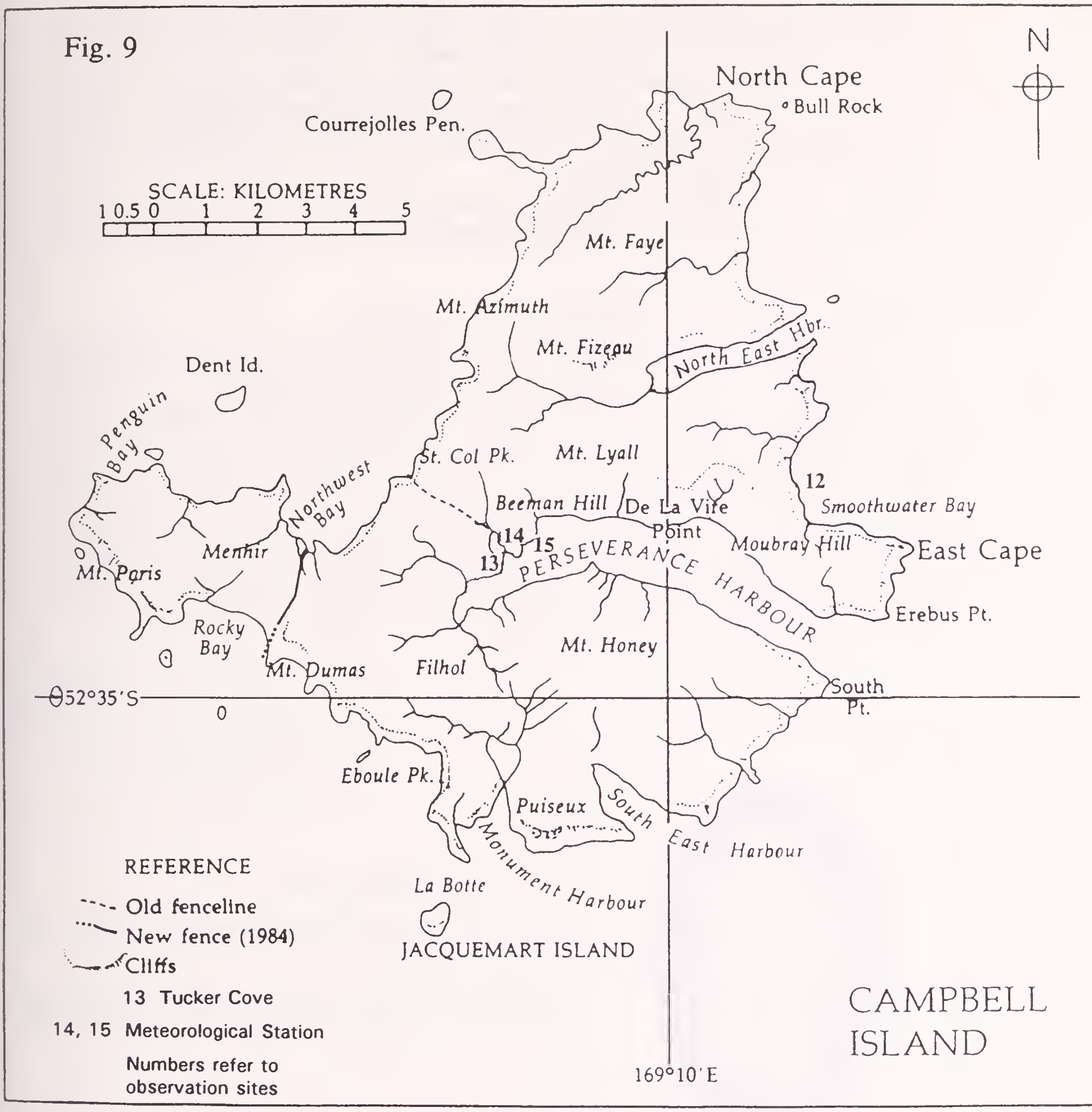
Location: Camp Cove, Carnley Harbour, Auckland Island. On green algae *Ulva laingii* one of two specimens seen underneath the fronds.
Depth 2 metres, snorkel.
Date: 29th January 1993
Description: Extended length 25mm. Smooth. Colour cream to pale yellowish buff, area near tentacles white. Dark reticulated pattern on the dorsal surface. Thin translucent foot. Slow moving.

10. Adams Island

Specimens from sites 10 & 11 were kindly posted to me after the trip by Pete McClelland, Southland Conservancy. Material washed up at Adams Island contained *Xenostrobus pulex* and *Cantharidus capillaceus capillaceus*.

11. Figure of Eight Island, Carnley Harbour

The small bivalve *Lasaea hinemoa* was under stones.



OBSERVATION SITES: CAMPBELL ISLAND (Fig .9)

12. Smoothwater Bay

A brief time was spent ashore at the Rock Hopper Penguin *Eudyptes chrysocome* colony. Here the 100 metre high basalt cliff shaded the boulder beach. Large *Cellana strigilis strigilis* and *Notoacmea pileopsis sturnus* were common. Juveniles of *N. pileopsis sturnus* were frequently found living on the backs of *C. strigilis strigilis.*

13. Tucker Cove, Perseverance Harbour

Tucker Cove is reached by a 15 minute board walk from the Meteorological Station. Although it was high tide, several species were found. Under rocks were clusters of *Lasaea hinemoa* together with *Kidderia campbellica*. At the junction between rock and mud were dark patches of *Laevilittorina antipodum*. A sieved juvenile pipi *Paphies australis* is an extension of range but has been previously recorded from the Auckland Islands.

Fitting in a visit to nesting albatross and magnificent megaherbs, having a snorkel and shore collecting proved a challenge for the only full day on Campbell Island. At least it was light until 10 pm!

14. Meteorological Station Snorkel, Perseverance Harbour

I snorkelled over a rocky area near the jetty. The water temperature was painfully cold, but enabled me to find living on rocks *Haliotis virginea huttoni*, *Pareuthria campbelli* and *Buccinulum pertinax pertinax*. Under rocks was one specimen of the uncommon chiton *Callochiton mortenseni*. (Fig.10) One of two specimens of *Onithochiton neglectus subantarcticus* was brooding dozens of juveniles under the girdle. All these specimens were found at a depth of one to three metres. I was told after getting out that the Meteorological Station staff have not been allowed into the water since a shark attack in 1992. The sea lions used to welcome divers and swim with them. Although no sea lions swam with me, a group of 15 did put on some energetic aquabatics beside the "Pacific Ruby" in the evening.

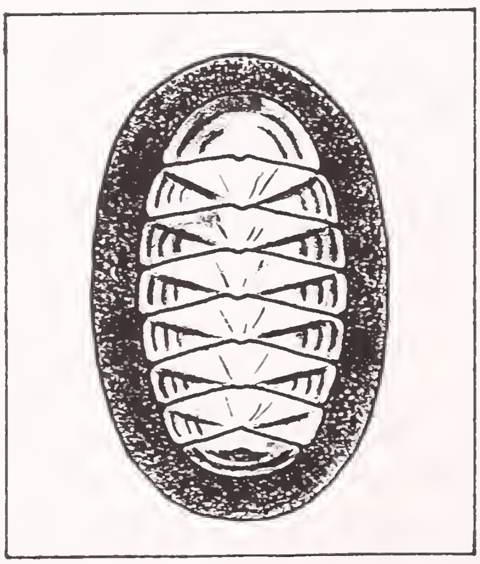


Fig. 10
CALLOCHITONIDAE
Callochiton mortenseni Odhner, 1924

Location: Meteorological Station, Perseverance Harbour, Campbell Island. Dep
1-2 metres at low tide, under rocks. Snorkel.
Date: 1st February 1993
Description: Length 19.5mm Width 11.4mm. Colour dark reddish brown. Surf
valves smooth to the eye but actually densely and minutely granulose. The
consists of closely packed minute scales.

15. Meteorological Station

Many freshly dead *Haliotis virginea huttoni* and the thin, bronze coloured limpet *Nacella terroris* were washed in. Clusters of *Kerguelenella innominata* were living in the vesicles of lava boulders at high tidal level.

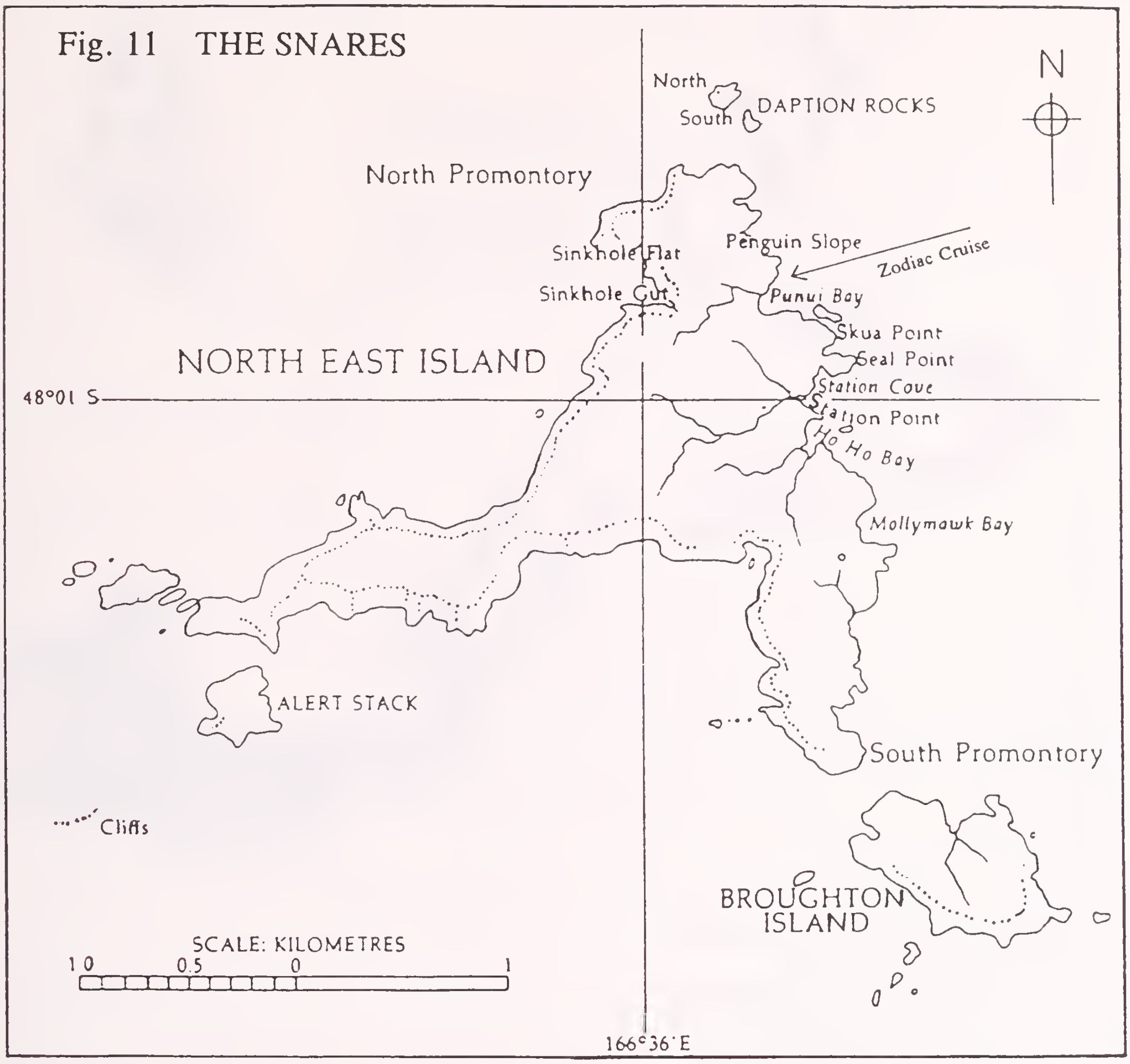


Fig. 11 THE SNARES

SNARES ISLANDS (Fig. 11)

The "Pacific Ruby" anchored for two hours in Punui Bay on North East Island. Landings are not permitted because of petrel burrows but we were taken close to shore in the zodiac. The Snares Crested Penguins *Eudyptes robustus* were very active both on the Penguin Slope and in communal fishing.

The endemic limpet *Cellana strigilis flemingi* was common on mid tidal rocks above the kelp zone *Durvillaea antarctica* (Fig. 12).

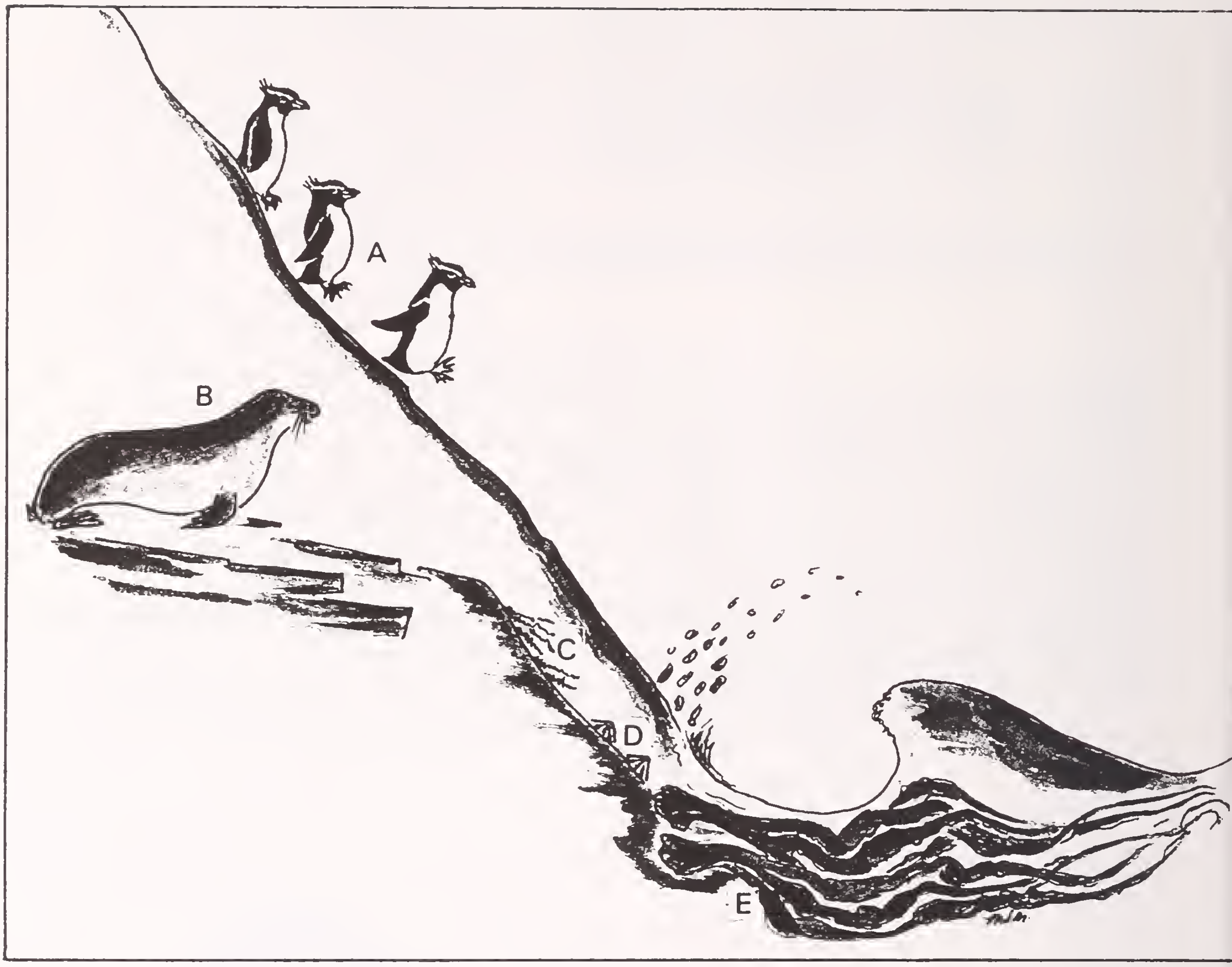


Fig.12
Diagramatic Section of Puhui Bay, Snares Island.

Key: A. Snares Crested Penguin *Eudyptes robustus*
B. Hooker's Sealion *Phocarctos hookeri*
C. Red Algae *Porphyra sp.*
D. Limpet *Cellana strigilis flemingi*
E. Kelp *Durvillaea antarctica*

DISCUSSION

1. *Leptochiton inquinatus* (Reeve, 1847)

Powell (1955) P.131, says "Odhner's (1924), record of *Lepidopleurus inquinatus* from Auckland and Campbell Islands is ignored, pending a critical examination of the material". While snorkelling at the Meteorological Station, Campbell Island, I found a live *Leptochiton inquinatus* under low tidal stones. My specimen matches both the description and specimens in my collection from the North Island. The Campbell Island specimen is large, the length measuring 14.5 mm.

Fig. 13 a
EATONIELLIDAE
Eatoniella kerguelenensis chiltoni (Suter, 1909)

Location: Camp Cove, Auckland Island. Algal wash.
Date: 29th January 1993
Description: Height 3.2mm. Width 1.7mm. Colour light grey to dark grey. Tall spire with lightly convex whorls

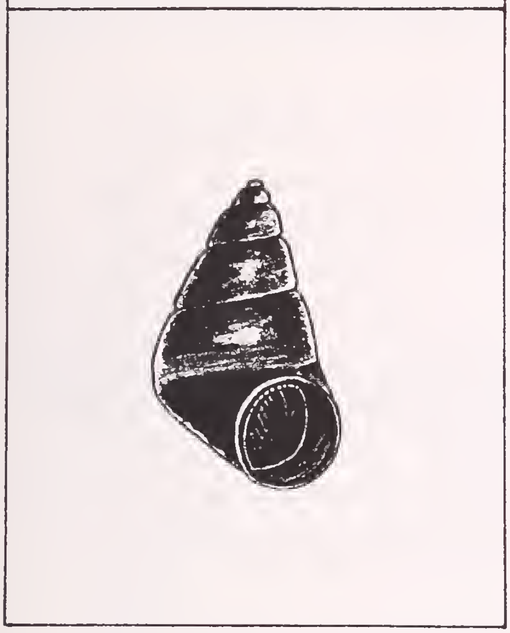


Fig. 13 b
EATONIELLIDAE
Eatoniella (Dardanula) olivacea (Hutton, 1882)

Location: Oneroa, Waiheke Island, Auckland. Algal wash.
Date: 15th May 1986
Description: Height 3.2mm. Width 1.7mm. Shell solid, ovate conic, smooth. Aperture oval, outer lip hardly reflected.

2. *Eatoniella* (Fig. 13)

Algal washings from seven sites produced dozens of *Eatoniella kerguelenensis chiltoni* but no *E. (Dardanula) olivacea*. These two species are similar. Powell (1979) includes Auckland Islands as a locality for *E. olivacea*, however in "Mollusca of the Southern Islands of New Zealand", P. 88, Powell says "Odhners, (1924) record of *E. olivacea* from the Auckland Islands probably refers to *E. kerguelenensis chiltoni*".

Ponder (1965) says, " *Eatoniella kerguelenensis chiltoni* is easily distinguished by a large, thin, light shell, greyish colour and large, transparent, white protoconch. Latter feature useful for identifying juveniles." My specimens from Perseverance Harbour, Campbell Island and some from Camp Cove, Auckland Island all have a white protoconch, but they are considerably eroded with damage several layers deep over much of the shell. In some cases the protoconch is eroded away. Specimens from Derry Castle Reef, Enderby Island and Tagua Bay, Auckland Islands are not eroded and all the protoconchs are dark grey, matching the colour of the rest of the shell. It appears to me that the white protoconch is not a reliable indicator for identification of this species.

3. *Eatoniella (Caveatoniella) perforata* Ponder, 1965 (Fig. 14)

Powell (1979) records *Eatoniella perforata* only from the north-east of the North Island. My two specimens found in shell sand at Derry Castle Reef , Enderby Island, Auckland Islands, may indicate that this uncommon species has a much wider distribution than previously realised.

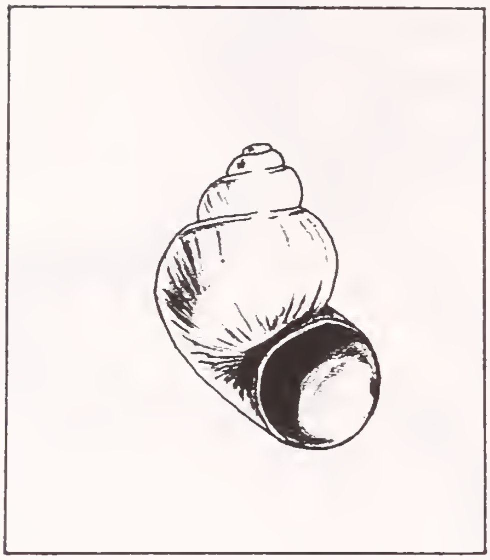


Fig. 14
EATONIELLIDAE
Eatoniella (Caveatoniella) perforata Ponder, 1965

Location: Derry Castle Reef, Enderby Island. In shell sand.
Date: 27th January 1993
Description: Height 1.3mm. Width 0.8mm. Colour white. Shell ovate conic, co
whorls. Aperture oval, angled above, sharply separate from body whorl. Deep,
umbilicus with strong growth lines in groove below.

4. *Anabathron*

Powell (1955) records *Scrobs trailli* from "Fourteen miles north of the Auckland Islands, 95 fathoms", however in Powell (1979) this Subantarctic location is omitted. This species was not obtained during my expedition.

Fig. 15
RISSOIDAE
Merelina foliata (Suter, 1908)

Location: Derry Castle Reef, Enderby Island, Auckland Islands.
In shell sand.
Date: 27th January 1993
Description: Height 1.6 mm Width 0.6 mm . Colour white. Strongly bicarinate,
uppermost keel the stronger, dense axial foliations crenulate the keels.

5. *Merelina foliata* (Suter, 1908) (Fig. 15)

Powell (1979) records *Merelina foliata* from the Snares , Stewart Island and the Antipodes Islands. As I have a specimen from Spirits Bay, this species may be more widespread than its present records indicate.

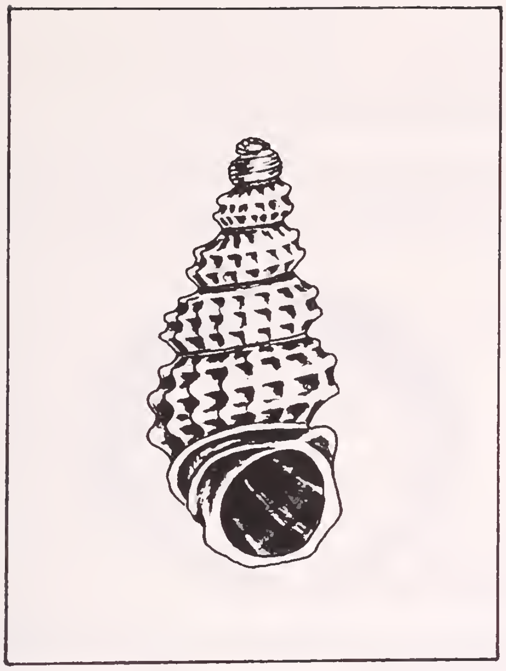


Fig. 16
RISSOIDAE
Merelina plaga Finlay, 1927

Location: Derry Castle Reef, Enderby Island. In shell sand.
Date: 27th January 1993
Description: Height 3.3mm. Width 1.4mm. Colour white.

6. *Merelina plaga* Finlay 1927 (Fig. 16)

The type specimens of *M. plaga* were dredged in fifteen to fifty fathoms off the Snares. They are found at all the Subantarctic Islands of New Zealand.

Powell (1939) gives the following features of *Merelina maoriana* to distinguish that species from *M. plaga*:

a) Smaller size. My specimens of *M. plaga* from Derry Castle Reef, Enderby Island, measure up to 3.3mm. In my collection are specimens of *M. maoriana* from Little Glory, Stewart Island, which measure up to 3.7mm in height.

b) Finer sculpture. I was unable to confirm this difference in the series of *M. maoriana* and *M. plaga* examined.

c) The addition of a third spiral keel on the body whorl. This is a variable feature on my specimens of *M. plaga* from Derry Castle Reef. The majority do have a third keel just below the suture, it is much weaker than the two keels on the periphery of the whorls.

d) The axials are more closely spaced (16 on the body whorl of *M. maoriana* as against 12 in *M. plaga*) In the series of both *M. maoriana* and *M. plaga* (excluding juveniles) examined, the number of axials on the body whorl of all specimens was between 14 to 16.

e) The sculpture is not gemmate. In my specimens of *M. maoriana* dredged in good condition from Port Pegasus and Little Glory, Stewart Island, there is gemmation at the intersection of the spirals and axials. In beach worn specimens this can be abraided away.

f) Colour is dull white without colour bands. All my Subantarctic specimens of *M. plaga* were white, but none were collected alive.

7. *Onoba* spp.

What appears to me to be several species of *Onoba,* comprising over fifty specimens, were collected at seven locations by washing algae and in shell sand. Because of the graded variation in shell proportions and number of spirals per whorl, I was unable to match all my specimens with the species descriptions.

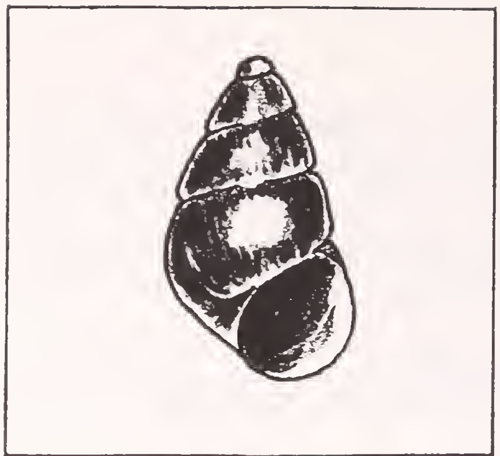


Fig. 17a
CINGULOPSIDAE
Tubbreva exultata exultata (Powell, 1933)

Location: Erebus Cove, Auckland Island. Algal wash. Snorkel.
Date: 26th January 1993
Description: Height 1.5mm. Width 0.8mm. Colour brown. Shell elongat
whorls flat, narrow umbilicus.

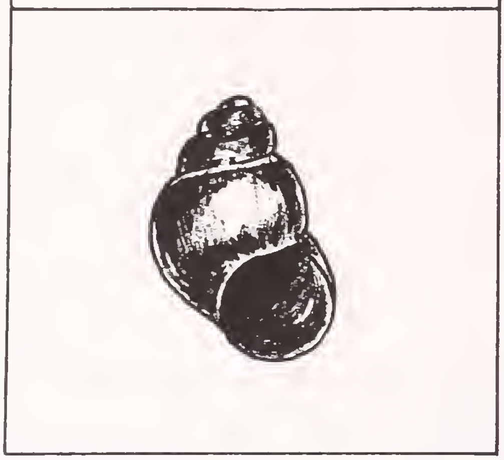


Fig. 17b
CINGULOPSIDAE
Tubbreva exultata sorenseni (Powell, 1955)

Location: Tagua Bay, Auckland Island. Depth 1-2 metres in gravel. Snorkel.
Date: 28th January 1993
Description: Height 1.0mm. Width 0.6mm. Similar to typical species but
shorter spire and a moderately inflated body whorl.

8. *Tubbreva exultata exultata* (Powell, 1933) (Fig. 17)

This species was living on algae taken snorkelling at a depth of 1 metre at Erebus Cove, Auckland Island. The 17 specimens show a graded series between *Tubbreva exultata exultata,* not previously recorded from the Subantarctic Islands, and *T. exultata sorenseni* from the Subantarctic Islands. My juvenile specimens appear to match more closely the description of *T. exultata sorenseni.* However a mature specimen of *T. exultata sorenseni* was taken in gravel at a depth of two metres, snorkelling in Tagua Bay, Auckland Island. This specimen has a shorter spire and a moderately inflated body whorl which are the distinguishing features for this species (Powell, 1979).

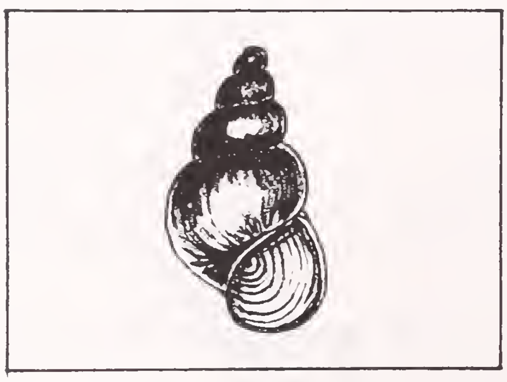


Fig. 18
RISSOELLIDAE
Rissoella (Jeffreysiella) rissoaformis (Powell, 1939)

Location: Derry Castle Reef, Enderby Island. Algal wash.
Date: 27th January 1993
Description: Height 2.9mm. Width 1.5mm. Colour light brown, fading out
body whorl and base. Broadly ovate with convex whorls, smooth.

9. *Rissoella* (Fig. 18)

This genus has not been recorded previously from the Subantarctic. At Derry Castle Reef, Enderby Island, Auckland Islands, specimens of *Rissoella (Jeffreysiella) rissoaformis* were living on algae on low tidal pools.

Specimens of a *Rissoella* sp. were obtained at Erebus Cove, Carnley Harbour, Auckland Island, from algal washing. These specimens appear to have a larger body whorl and aperture than *R. rissoaformis.* A few juvenile *R.* sp. were living on algae at Camp Cove, Carnley Harbour, and on the back of *Plaxiphora aurata* at Tagua Bay, Carnley Harbour.

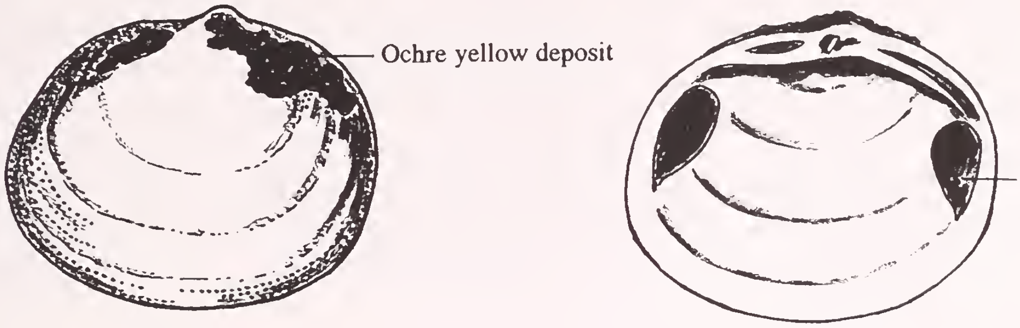


Fig. 19
ERYCINIDAE
Arthritica bifurca (Webster, 1908)

Location: Camp Cove, Carnley Harbour, Auckland Island. Sieved from low tidal mud.
Date: 29th January 1993
Description: Height 2.1 mm, Width 2.5 mm. Colour white, covered by pale yellowish periostracum. Partly encrusted with an ochre yellow deposit, especially around the hinge. Surface almost smooth except for minute malleations and weak growth lines.

10. *Arthritica bifurca* (Webster, 1908) (Fig. 19)

This genus has not been recorded previously from the Subantarctic. Specimens of *Arthritica bifurca* were obtained at the following locations:

a) Derry Castle Reef, Enderby Island, Auckland Islands, washed up in shell sand.
b) Camp Cove, Carnley Harbour, Auckland Island, living specimens were sieved from low tidal mud.
c) Tagua Bay, Carnley Harbour, Auckland Island. Living specimens were obtained from gravel taken snorkelling at a depth of 2 metres.
d) Meteorological Station jetty, Perseverance Harbour, Campbell Island. A single valve was found in mud taken snorkelling at a depth of 1 - 2 metres.

When compared to North Island specimens from Fitzroy Harbour, Great Barrier Island, the specimens of *A. bifurca* from Auckland Island had:

1. Heavier and thicker shells;
2. Heavier hinges;
3. Subobsolete callus patches near the adductor scars.

CONCLUSION

The Subantarctic trip with its unique scenery and wildlife was a memorable experience. Who could forget 11 metre waves in the Southern Ocean?

ACKNOWLEDGMENTS

I thank Dr Bruce Hayward for assistance at the planning stage, for kindly reviewing the manuscript and for permission to look at type specimens in the Auckland Museum collection; Bruce Hazelwood for identifying chitons; Pete McClelland for authorising the Department of Conservation collecting permit and for posting shell sand from the Auckland Islands after my trip; Professor John Morton for advice on collecting; Dr Hugh Grenfell and Jenny Riley for producing the checklist; Glenys Stace for giving ongoing editorial advice and patiently producing the manuscript; Rodney Russ and the crew of the "Pacific Ruby" for much tolerant support; Dr Richard Willan for identifying specimens and his detailed suggestions for improving the manuscript.

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MOLLUSCA OF AUCKLAND AND CAMPBELL ISLANDS: SPECIES LIST

KEY:

I	-	Island
Int.	-	Intertidal
Rf.	-	Reef
Met. Stn.	-	Meteorological Station
A	-	alive
D	-	dead
j	-	juvenile
*	-	extension of range for this species
Sn.	-	snorkel

Stations 1 - 11, Auckland Islands.
12 - 15, Campbell Island

NAME CHANGES:

In Powell (1979)	Updated Name
Plaxiphora aurata campbelli	*P. aurata*
Rhyssoplax aerea huttoni	*R. aerea*
Terenochiton (=*Lepidopleurus* Powell, 1955)	*Leptochiton*
Balcis	*Melanella*
Chione aucklandica	*Austrovenus stutchburyi*
Estea	*Pisinna*
Lamellaria cerebroides	*L. nodosa*
Littorina	*Nodilittorina*
Marginella	*Volvarinella*
Maurea	*Calliostoma*
Monia	*Pododesmus*
Rufodardanula	*Tubbreva*
Scrobs	*Anabathron*
Subonoba	*Onoba*
Turbonilla	*Chemnitzia*
Mytilus edulis aoteanus	*M. galloprovincialis aoteanus*
Chlamys delicatula	*C. patagonica delicatula*
Lasaea rubra hinemoa	*L. hinemoa*
Cyamium problematicum	*Cyamiomactra problematicum*

POLYPLACOPHORA	1. Erebus Cove	2. Ranui Cove, Int.	3. Sandy Bay, Enderby I	4. Derry Castle Reef, Int	5. Gargoyle Point	6. Musgrave Inlet, Int.	7. Tagua Bay, Sn.	8. Camp Cove, Int.	9. Camp Cove, Reef, Sn	10. Adams Island	11. Figure 8 Island	12. Smoothwater Bay	13. Tucker Cove	14. Met. Stn, Sn.	15. Met. Stn, Int.
Callochiton empleurus				D			A								
C. mortenseni														A	
Ischnochiton circumvallatus				A			D	A				A		A	
I. luteoroseus				D*											
Leptochiton inquinatus														A*	
Notoplax sp				D,j*											
Onithochiton neglectus subantarcticus	A			A			D							A	
Plaxiphora aurata				D			A	A							
Rhyssoplax aerea							A								
GASTROPODA															
Actinoleuca campbelli campbelli	A			D										D	
Benhamina obliquata				A											
Berthella mediatas				D											
Buccinulum pertinax pertinax	A													A	
B. vittatum littorinoides				D			A	A							
Calliostoma spectabilis					D										
Cantharidus capillaceus capillaceus	A	A	A	A		A		D		D		A		A	
Cellana strigilis strigilis	A	A	A	D		A	A	A	A			A			A
Chemnitzia lillingtoniana				D											
C. zelandica														D*	
C. spp.				D			D								
Cirsonella densilirata				D											
C. sp.														D	
Comptella devia				D											
Diloma arida						D	A	A	A						
D. nigerrima				A				D		D					
Eatoniella fuscosubucula	D			D			D								
E. kerguelenensis chiltoni	A			A		D	A	A				A		A	
E. perforata				D*											
E. poutamo				D											
E. roseola				D			D	A	A						
E. smithi				D*			A*							D*	
E. verecunda				D			D								
Eatonina cf. atomaria							A*								
E. micans							D*							A*	
Emarginula striatula				D											
Evalea sabulosa				D											
Haliotis virginea huttoni				D		D		D						A	D
Kerguelenella innominata												A			A

GASTROPODA	1. Erebus Cove	2. Ranui Cove, Int.	3. Sandy Bay, Enderby I	4. Derry Castle Reef, Int	5. Gargoyle Point	6. Musgrave Inlet, Int.	7. Tagua Bay, Sn.	8. Camp Cove, Int.	9. Camp Cove, Reef, Sn	10. Adams Island	11. Figure 8 Island	12. Smoothwater Bay	13. Tucker Cove	14. Met. Stn, Sn.	15. Met. Stn, Int.
Laevilitorina antipodum													A		A
Lamellaria nodosa									A						
Lepsithais lacunosus			A	D											
Linopyrga rugata rugata				D											
Liotella rotula				D											
Macquariella aucklandica				D											
Margarella antipoda antipoda	A			A		A		A					A	A	A
M. antipoda rosea				A*											
Melanella aucklandica				D											
Merelina foliata				D*											
Merelina plaga				D			D								
Nacella terroris															D
Notoacmea pileopsis sturnus	A			A		A		A				A	A		
Nodilittorina cincta				A		A									
Notosetia aff. aoteana				D*											
Odostomia sp.				D											
Onchidella campbelli				A				A							
Onoba fallai				A											
O. delicatula				D											
O. delta				D											
O. edita								A*							
O. insulpta								A							
O. spp.	A			D			A	A	A					A	A
Pareuthria campbelli														A	A
Paxula subantarctica sorenseni														A	
P. subantarctica subantarctica	A			D			D	A							
P. transitans				A*			D*								
Pisinna minor				A											
P. rekohuana rekohuana				A			A	A							
P. subfusca subfusca	A*														
Puncturella demissa				D*											
Rissoella rissoaformis				A*											
R. sp.	A,*j						A*j	A*j							
Rissopsis lubrica				D*											
Scissurella bountyensis				D*											
Sigapatella novaezealandiae	D			D											
Sinezona levigata	A			D											
S. lyallensis				D*											
S. subantarctica				D*											
Thoristella chathamensis aucklandica	A			D				D	A						
Trichosirius octocarinatus				D											
Triphora sp.				D											
Tubbreva exultata exultata	A*						A*								

m	1. Erebus Cove	2. Ranui Cove, Int.	3. Sandy Bay, Enderby I	4. Derry Castle Reef, Int	5. Gargoyle Point	6. Musgrave Inlet, Int.	7. Tagua Bay, Sn.	8. Camp Cove, Int.	9. Camp Cove, Reef, Sn	10. Adams Island	11. Figure 8 Island	12. Smoothwater Bay	13. Tucker Cove	14. Met. Stn, Sn.	15. Met. Stn, Int.
Uberella vitrea				D											
Volvarinella lurida				D											
V. stewartiana							D								
Xymene aucklandicus						D			A						
X. mortenseni mortenseni				D			D								
Xymene sp.	D														
Zalipais lissa														A	D
Zerotula aff. nautiliformis								D							
BIVALVIA															
Arthritica bifurca				D*			A*	A*						D*	
Aulacomya ater maoriana				D				A							
Austrovenus stutchburyi							D								
Borniola decapitata				A											
Chlamys patagonica delicatula														D	
Condylocardia crassicostata				D*											
Cosa costata				D, j											
Cyamiomactra problematica				D											
Gaimardia fosteriana aucklandica				D											
Hiatella arctica				D*											
Kidderia campbellica				D									A		
K. costata				D											
Lasaea rubra hinemoa				D						D	A	A	A		
Leptomya retiaria aucklandica							D								
Lissarca aucklandica	A			D		A	A	D						D	
L. trapezina				D*											
Modiolus areolatus				D				D						A, j	
Mysella unidentata				D			D								
Mytilus galloprovincialis aoteanus							A	D						D	
Neolepton antipodum	D			D			D								
Nucula hartvigiana														D	
N. nitidula				D*				A*							
Paphies australis													A*		
Philobrya hamiltoni				D*											
P. pinctata				D*											
Pododesmus zelandicus				D											
Ruditapes largillierti				D			D	A, j							
Tawera rosa								D							
Verticipronus mytilus				D											
Xenostrobus pulex						A		A		D		A*j			

The Author, sieving at low tide
Camp Cove, Auckland Island

Meteorological Station, Campbell Island.

CHLAMYS GEMMULATA

by Bev Elliot

On August 31st 1993 I walked the new Pacific Walkway in North Canterbury, from Hawkswood to Medina, over the 2000 foot Hawkswood Range. On arrival at the coast at Medina, I paused to pick up a sponge covered *Chlamys gemmulata*. And another, and another, and another.......! This was not a shell collecting trip; photographing the spectacular coastal scenery being the main objective. I had 11km to tramp down the coast to Waiau Mouth, another 11km back over the Hawkswood Range to Parnassus, and a further 9km to walk or hitch-hike back along the main road to my van at Hawkswood. I did not want a large bag of shells to add weight and bulk to my already heavy pack. Besides, bending over to pick up shells while carrying a full pack is not so easy. But who could resist these uncommon, deepwater *Chlamys,* so seldom seen washed ashore? Each encased in a coating of sponge, they were mostly in good condition, some still containing the animal.

I had to choose between tramping at low tide where the sand was firmer, the pace was faster and the views of the towering cliffs were better or high tide, at a slower pace in softer sand, with my eyes on the tide line instead of the scenery and frequent pauses to bend down, pack and all, to pick up more *Chlamys* to add to my bulging bag.

In an effort to reduce the bulk, I tried pulling the sponge off them, but this was too time consuming, as I needed to get the coastal part of the tramp over while the tide was low. Besides, pulling the sponge off usually resulted in pulling the two valves apart and how would I ever get them all paired up again? ! So in the bag they went, sponge and all, eventually adding almost four pounds weight to my load, to say nothing of the considerable bulk of all that sponge.

The *Chlamys* on the beach

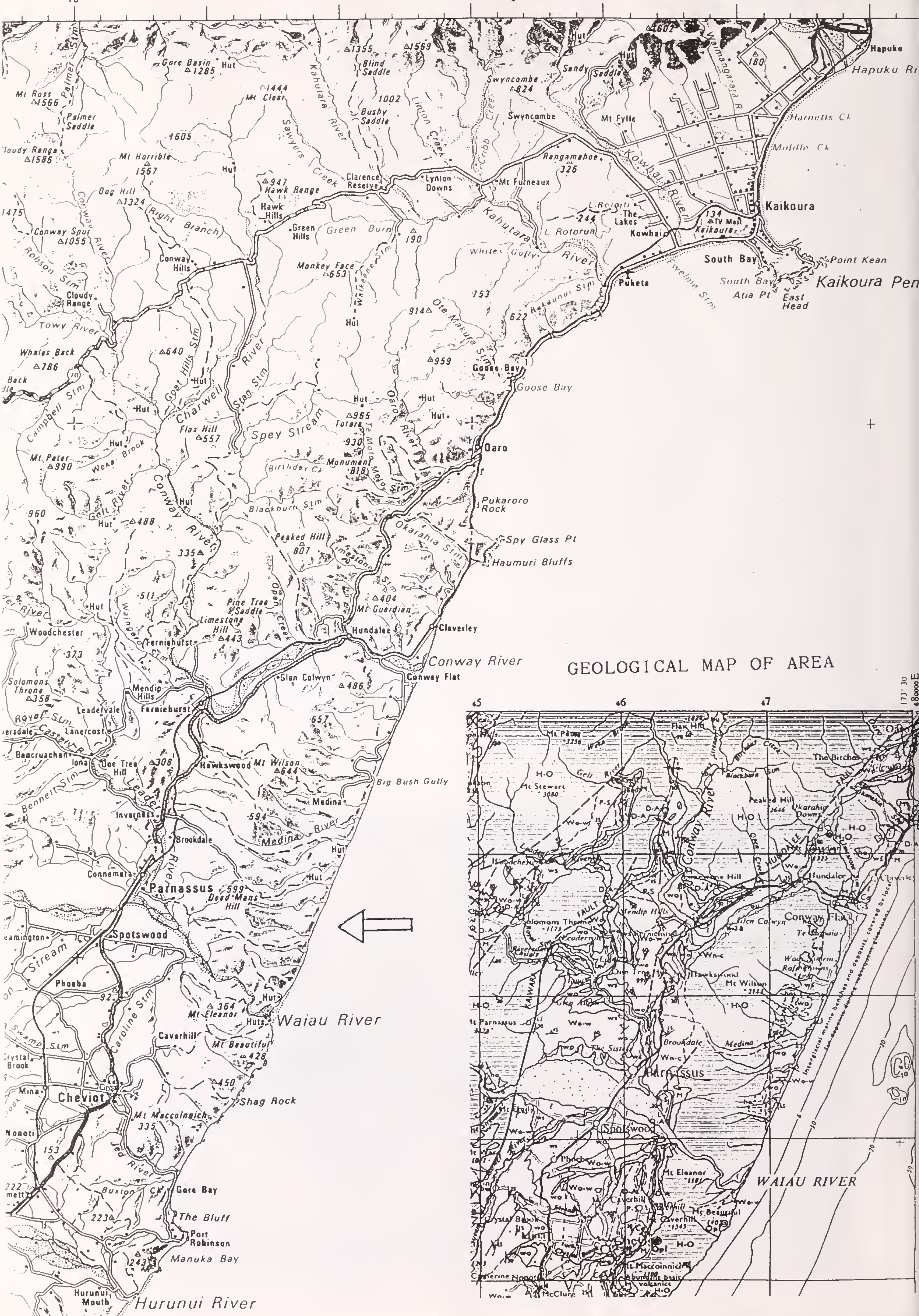
Colour range of the *Chlamys*.

I reached Waiau Mouth at 10am and was glad to take off my pack for a while and explore, photograph, eat and rest, before turning inland, with no more shells to pick up. But I still had to carry them and it was sunset before I got a ride back to my van waiting for me at Hawkswood.

Over the next three or four days I tackled the job of dealing with my bag of treasure. 162 pairs of *Chlamys gemmulata!* 82 pink and mottled pink and white. 42 orange. 28 purple. 9 white. 1 yellow (not the canary yellow of *C. zelandiae,* but light orange yellow like *C. delicatula.)* Also 11 *C. dieffenbachi* - 10 purplish and 1 orange. And one *Maurea waikanae* with operculum.

Chlamys gemmulata from Golden Bay, Nelson average 25-30mm in size and lack the purple colouring. *Chlamys gemmulata* from Stewart Island average 55-60mm in size and purple tends to be the most usual colour. So it is not surprising that these Waiau ones, found halfway in between, are midway in size, average 40-50mm, with about one fifth being purple.

In the cliffs south of Medina, fossil *Chlamys gemmulata* are sometimes found, easily identifiable, but too fragile to collect. The age of the cliffs in this area is Opoitian, 3.6 - 5 million years old.



GEOLOGICAL MAP OF AREA

NEW IMMIGRANTS?

by Peggy Town

The genus *Donax*, family Donacidae, is not present in the recent molluscan fauna of New Zealand. Yet, in the New Zealand collection of the Auckland Institute and Museum, there are two match boxes containing species of Donacidae.

The first "lot" was, according to the label, found at Kaiteriteri, near Motueka, Nelson, and is labelled "(almost certainly a Melanesian species) A.W.B.P." although there is nothing to say that he found it. There are two complete shells and I have checked them against such descriptions as I can find, and they are clearly *Donax (Latona) cuneatus* Linneus 1758. This description is taken from Bivalves of Australia; "shell length to 35mm; smooth, glossy posterior slope with concentric wrinkles. Colour variable from white, orange, brown, green or purple with purple radial rays, interior similarly coloured. Habitat littoral sand. Distribution coastal, central Queensland to Northern Territory and N.W.Australia."

This is a shell we have found in large quantities on the Queensland coast. The shape is very similar to our Tuatua, *Paphies subtriangulatum*, but it (*Donax*) is much smaller and more colourful. I find the use of the word "glossy" rather puzzling, and there is no mention of the concentric growth lines over the whole shell which give rise to the "concentric wrinkles".

The second "lot" is a single valve found on the high tide line, Tahunanui Beach, Nelson, in January 1994 by M. Eagle and G. Stace. I am told it was the result of a determined search! In size it is little different from the others but the following description, which is an amalgam of two, will show that there are distinct differences. *Donax (Deltachion) electilis* (Iredale, 1930) Shell bluish white, normally with two brownish rays. Solid, triangularly oval. Sculpture, fine radial striae on the anterior two-thirds of the shell, becoming stronger posteriorly. On the posterior slope, which is strongly keeled and with the end truncated, they are crossed by concentric ridges, giving a fine clathrate appearance. Umbos purplish, interior white with a large purplish blotch descending from the umbo to near the ventral margin, which is crenulated. Habitat littoral sand. Distribution S.W.Australia, S. Australia and Victoria. Has also been recorded from N.S.W. and Queensland. Neither of the descriptions amalgamated above mentions that this shell is glossy.

So how did these shells come to be on New Zealand beaches? The fact that both were found on Nelson beaches may be a clue - did the East Australian current bring veligers? If it did perhaps it has/will bring more. Anyone who shells around Nelson should be on the look out, and do please let us know if you find any.

References:
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SHE SHARES SEA SHELLS FROM THE SEA SHORE

(A reflection on some historical aspects of New Zealand shellcraft)

MICHAEL K. EAGLE

Many people, lured by their pure aesthetic beauty and motivated by an inherent drive to collect, have wandered at some time or another along a beach, picking up beautiful, multicoloured, sculptured seashells. They are usually kept for a time, either in the old bread bag that they were collected in or some other similar foodstuffs container, before being thrown away.

It was during the 1950's that all the secrets of that delightful, fascinating (and sometimes profitable) hobby "shellcraft" came into its own. The hobby showed how, with simple materials and the minimum of home handyman tools those so inclined were able to make ?attractive objects de art from shells which supposedly delighted the creators and their friends. No matter whether they collected themselves or bought their shells from a dealer, shellcraft was promoted as an intriguing and skilful hobby.

It was a pursuit suited to all ages. Whether you were five or ninety-five, the seashore held a fascination that transcended the traditional embroidery and cultural arts. To the European New Zealander, a latent island race with a natural curiosity about the two oceans that beat ceaselessly upon our shores, shells were thrilling to discover and the outdoors activity invigorating. Limpid rock pools, sanddrift, seaweeds, and wash-ups, all provided happy hunting grounds for the modern hunter-gatherer. Always the excitement of the find, lovingly curated, proudly compared with others of the same ilk. The triumph of trophies washed, stowed and taken home provided a grand source of enjoyment weeks, months, years later. Some were used as counters in card games, others flung into the goldfish tank or thrown into the garden; it was great also to make ornaments for the home, models for the children, and welcome(?) gifts for friends whilst listening to the radio at nights.

"She sells seashells from the seashore" became "she sells super seashells from the seashore at the shellcraft shop". It was mainly a woman's occupation, although some 1950's "new-age" gentlemen did exist and actively participated in the hobby. The major material was free for the picking up; our many beaches providing a prolific source of many different mollusc species, nearly all of the useful to the shellcraft enthusiast. At that

time an influx of immigrants, parcels post and a restrained Custom's Department allowed the importation of tropical cowries, murexes and various others from further afield. Friends were often inveigled into bringing shells home from beach bach holidays or sojourns overseas. Scallop shells were scavenged from processing plants. Live-taken shells were soaked in water or preferably a mild solution of bleach for several hours, then brushed vigorously with a brush. Turpentine was used to remove periostracum stains. Glossy tropical shells were cleaned in warm water with a little detergent or soap so that surfaces were not scratched or otherwise damaged.

Plaster of paris, glue, oil and water paints, varnish and paint brushes were the mainstay of materials. Imported British glues such as Croid, Duraglue, Durofix and Seccotine, were replaced at a later date by locally manufactured "UHU". Imported Barbola paste provided a filling that was shaped with a knife or modelling tool. A damp pad was recommended to be placed on the lid this and other filler pastes such as Alabastine or Polyfilla to prevent the material from drying out and being workable when required. The majority of shellcraft models were improved by painting. Water colours were more or less transparent, oils produced a brilliant effect, opaque poster colours often predominated. All needed a coat of varnish to make the medium durable. An unbelievable "kitschness" was achieved by employing enamel paint or quick-drying lacquer which ultimately hid whatever beauty the seashell's originally possessed!! "Pearl" and metallic paint, though unreal in presentation and totally artificial in concept, was thought to be particularly charming. The craft often produced an object unrecognisable as a seashell model by virtue of a painted disguise.

The varnished shell models gave a glossy surface to supposedly provide a more durable, dust-free and attractive finish. However, the sculpturing, many joints and the clumsiness of most models produced the opposite effect. They became window-sill, mantle-piece or curtain pelmet dust-traps; art deco apparitions that festooned californian-type bungalows. Clear "dope" and quick-drying Chinese lacquer or copal varnish, darkened the natural colour of the shells so that they become a plastic yellow-brown stained, phantasmagorical "thing" object in very short time (Fig.1).

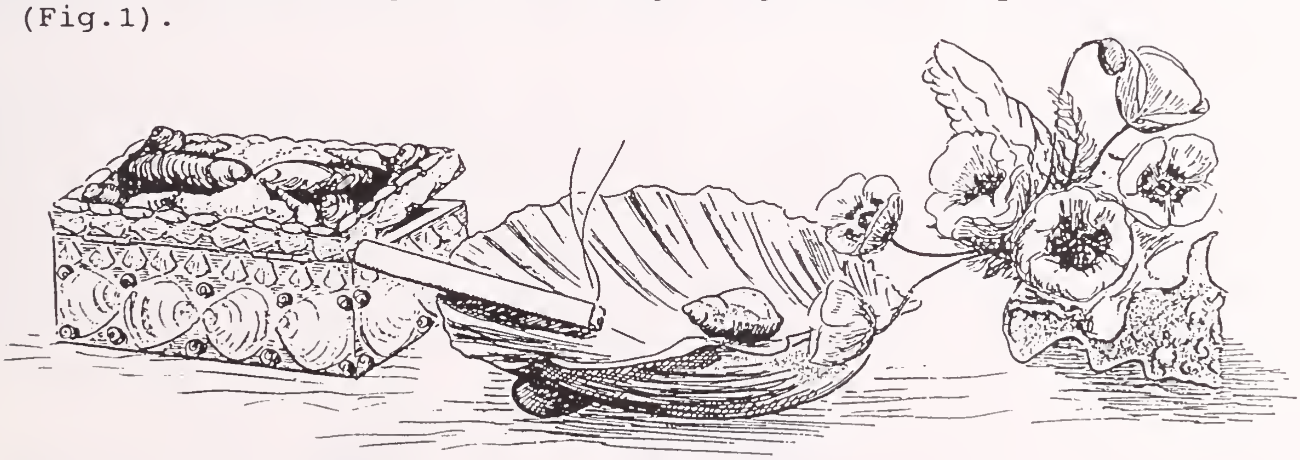


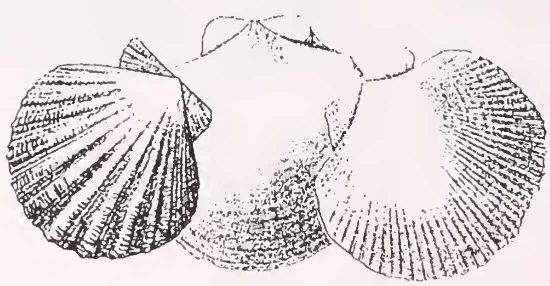
Fig.1. Examples of shellcraft items made for home use: shell-box; cigarette ash-tray; flower arrangement.

Both paint and varnish were applied by soft bristle brushes such as camel-hair, which, because of their initial high cost, were meticulously cleaned, placed bristles upwards in a vase or jam-jar, reshaping the points with the fingers. Working tools were a knife for smoothing out joining pastes or removing surplus glues, a pair of pliers for breaking off shell edges, cutting wire for flower stems, bending stiff wire into shape, and so on. An ordinary knitting needle often reached where a knife blade could not, was used to add or remove that extra touch of glue or jointing paste which seemed to make all the difference. Two or three grades of sandpaper were used to smooth rough corners or edges of shells as was a small file. Many shell models, and in particular, nearly all shell jewellery, involved the boring of holes. An archimedian drill proved very satisfactory; the purchase of a "Wolf" or early electric drill usually beyond the means of most people. The archimedian drill (Fig.2) was bought

Fig.2. Example of an archimedian drill.

cheaply from department or specific hardware stores. A vice was often used to hold delicate and brittle shells while they were being worked (the jaws being padded with pieces of felt or cloth). Pipe cleaners, copper wire, sealing wax and ordinary household articles such as the humble matchstick, were often utilised. Shell-boxes were made from cigar boxes, white wood food boxes and the odd baculite box. Even jam-jars and the odd bottle were handy in making supposedly useful and pleasing vases when decorated with shells. Jewellery mounts, nylon thread, and elastic could be obtained from the local jeweller, craftshop or draper. Most foundations, however, were resurrected from lying around the house. The inexpensiveness of the hobby inevitably shone through in the finished product. Simple shellcraft models that were manufactured en mass during the 50's and 60's were: cigarette and trinket boxes, ashtrays, shell animals and insects, shell flowers, vases, table decorations and centre-pieces,shell figurines, lampshades and stands, picture frames, bathroom ornaments, hatpins, brooches, earrings, necklaces, bracelets and buttons.

Bedecked in inexpensive, sometimes gaudy ornaments and jewellery, the shell craftspeople of yesteryear passed many a patient hour working with scallops, cowries, limpets, tusk shells, mussels, oysters,cockles, tellinas, tua tua, rock whelks, conch shells and pipi. With almost limitless possibilities, simple construction techniques and an inexpensive, plentiful supply of raw material, the joy of discovery and ultimate utilization has proven paramount in perpetuating this distinctive "kitsch" decorative art.



BOOKS

Rae Sneddon

There were not only shells for sale among the dealers's tables at the Adelaide Shell Show. Two stalls were selling T-shirts and sweat shirts, and another was piled with books - shell books of course. It was the place for Ruby's Worldwide Shell Books and Ruby was there in person. But alongside her was Chris Mitchell who has just bought the business and will be running it under the same name from Broome in West Australia.

I had on order from Ruby two books, "A Guide to Worldwide Cowries" by Lorenz and Hubert, and the two volumes of "Australian Marine Shells" by Barry Wilson. The first volume of Barry Wilson's book was there and the book on Cowries, and I was able to buy another copy of Volume I of Barry Wilson's book for our library from Chris Mitchell with the second volume to come when it is published.

These are excellent books and have had very good reviews. Illustrations are in colour and are very clear and make it easy to identify shells, particularly in the Cowrie book which devotes one plate to one shell, showing all the variations of that shell. There are also numerous sketches throughout the text and tables are included describing variations and maps showing where the species may be found. Barry Wilson's book also has many sketches showing features in the shells. These two books are expensive but well worth having.

Other books I bought for my own library were the two volumes of "European Seashells" by Poppe and Goto, published in 1991 and 1993. Illustrations in these books too are very clear and include details of range and habitat, though the descriptions of the shells are rather sparse.

Also from Chris Mitchell I purchased two second hand books "Shells of the Western Pacific in Colour" Vols. I and II, the first volume by Tetsuaki Kiri, 1962 and the second by Dr. Tadashige Habe, 1964. These books have all colour plates and descriptions of each shell, but details of range are largely confined to Japanese waters.

The Shell Show was not the only place to buy shell books as we found when visiting book shops in Adelaide. From one shop I bought "Simon & Schuster's Guide to Shells", in the Guide to Nature Series. This is a more popular style paper back with good illustrations, two to a page and descriptions alongside including a map and diagrams of size and habitat. It gives the scientific name and family but does not give the author or date.

A better buy was "The Encyclopedia of Seashells" by Gary Rosenberg, a hard back with good illustrations and descriptions and all the necessary data.

However it is by no means comprehensive.

These books were the sum total of shell books I acquired in South Australia, though I also managed to squeeze into my luggage a couple of books on Australian history. Fortunately I was able to pass two of the bigger shell books over to my fellow travellers, which made my suitcase a little less damagingly heavy!

POIRIERIA

Auckland Museum
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CONTENTS:

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Subscription to "Poirieria" is by membership of the Auckland Museum Conchology Section (enquire of the Secretary) or by payment of $20 per calendar year for surface mail and NZ$25 for economy air mail.

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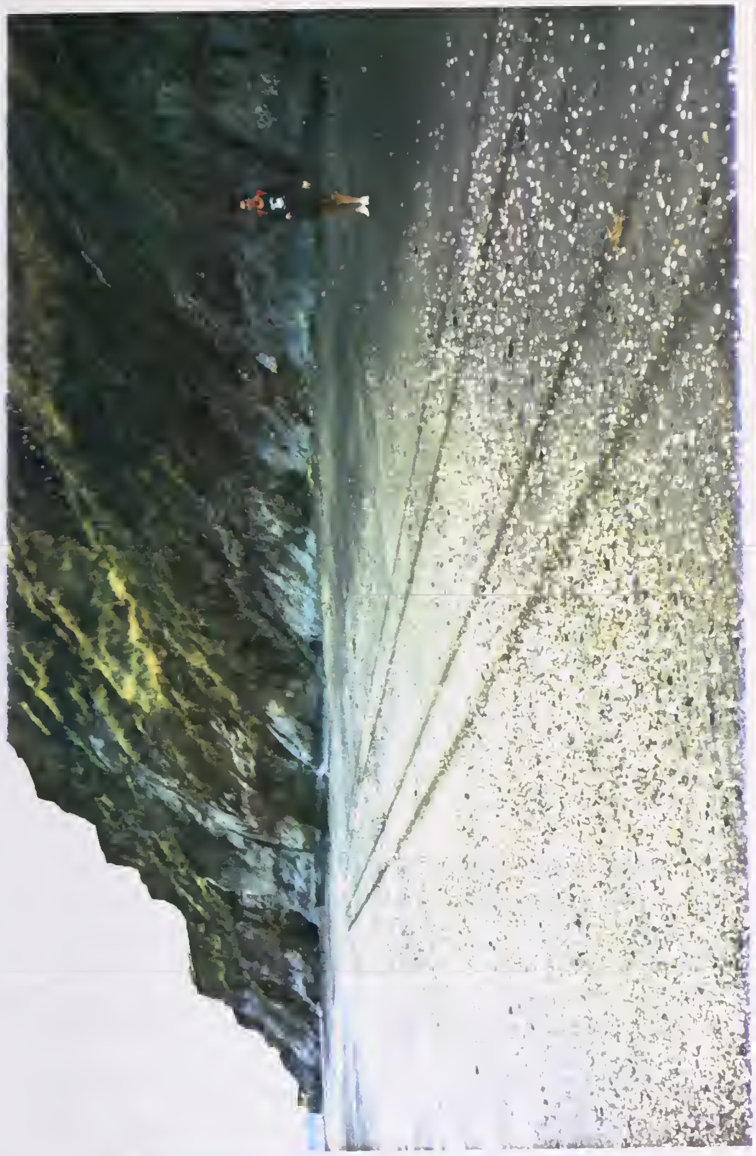
All other correspondence should go to: The Secretary, Mrs M. Town, 9 Otakau Rd. Milford, Auckland 9, New Zealand.

EDITORIAL:

This edition of Poirieria marks the beginning of the compilation of a Master Species List on which we are recording the species collected from different locations. As we receive species lists as part of articles, they will be recorded in spread sheet format, so that in the future we will be able to produce recent information on any species or location. Members are invited to contribute species lists if they are interested in helping transfer them to the spread sheet! Correct identification is essential.

Acknowledgement:

The Editor would like to express her thanks to Margaret Morley and Mike Eagle for their untiring assistance with editing and transfering to the computer some of the articles for this edition. Frank Bolton's help with scanning other articles onto disk is sincerely appreciated.




SOLOMON ISLANDS PLACOSTYLUS SNAILS

ABSTRACT

The purpose of this paper is to provide a list of the Solomon Islands species which have been named since 1848. The lack of published distributional records for some species is noted together with several problematical identifications.

INTRODUCTION

The Bulimulid landsnails of the genus Placostylus are a distinctive and interesting group scattered over a number of islands of the South West Pacific. They extend from the North Island of New Zealand, to Lord Howe Island, New Caledonia, Fiji and Vanuatu with a northern limit in the Solomon Islands. Those in the Solomon Islands vary considerably, some are ground living species while others are arboreal and have much lighter shells, generally more like those from Fiji.

The first to be recorded was the well known, common white species from San Cristoval (Makira) then named Bulimus miltocheilus (Reeve in Conc. Icon. 1848). Since then some forty odd names have been proposed for the various species, subspecies and varieties listed from the Solomon Islands. Some, as one would expect, have now been reduced to synonyms or mere forms.

The distributional range of a number of the recognised species is still not well known and much field work remains to be done, especially on some of the larger islands. In some cases specimens of certain species appear to have been recorded only from the type locality.

The amount of variation in shell shape is also a problem and not yet fully understood.

P. strangei, Pfr. 1855
Munda, New Guinea.

GENERALLY RECOGNISED SUBGENERA

1.
- Aspartus Albers 1861
  - having thin white shells, weak columella fold and no spiral sculpture.
  Subgenotype: miltocheilus (Reeve 1848).

2.
- Acrostylus Clench 1935
  - shells with a single colour, acute spire. No stripes or blotches. Subgenotype: acutus Clench 1935.

3.
- Eumecostylus Albers 1861
  - having long slender shells and strong columella fold.
  Subgenotype: cleryi (Petit. 1850).

4.
- Placocharis Pilsbry 1900
  - brown or variegated cuticle, strong columella fold.
  Sugenotype: macgillivrayi (Pfeiffer 1855).

5.
- Proaspartus Clench 1941
  - distinctive wavy spiral sculpture.
  Subgenotype: sancristovalensis (Cox 1870).

6.
- Santacharis Iredale 1927
  - small oval shells.
  Subgenotype: solomonensis (Pfeiffer 1852).


1.


2.


3.


6.


5.


4.

SPECIES AND SUBSPECIES FROM THE SOLOMON ISLANDS

Placostylus (Placostylus) gizoensis Clench 1941
Gizo Id. New Georgia.

Placostylus (Aspartus) miltocheilus (Rve 1894) San Cristoval Id.
(Aspartus) miltocheilus albolabris (Brazier 1894)
San Cristoval, Santa Anna.
(Aspartus) miltocheilus mayri. Clench 1941.
Ulawa Id.
(Aspartus) miltocheilus minor Brazier 1894
(Aspartus) miltocheilus paravicini B Rensch 1934
Ugi Id.
(Aspartus) miltocheilus stramineus (Brazier 1889)
San Cristoval Ugi Id.

Placostylus (Acrostylus) acutus. Clench 1935. Guadalcanal.
(Acrostylus) calus. Smith 1891. Malaita Id.
(Acrostylus) malaitensis. Clench 1941. Malaita Id.
(Acrostylus) ophir. Clench 1941. Malaita Id.
(Acrostylus) unicus. B. Rensch 1934. Marovo Lagoon.

Placostylus (Eumecostylus) cleryi. Petit 1850. San Cristoval Id.
(Eumecostylus) cleryi. cookei. Clench 1941.
San Cristoval Id.
(Eumecostylus) cleryi.clenchi. Jaeckel & Schlesch
1952 Gela. Guadalcanal.
(Eumecostylus) fraterculus. B. Rensch 1934
Guadalcanal.
(Eumecostylus) cyclindricus Fulton 1907. Ysabel Id
Guadalcanal.
(Eumecostylus) krefti. (Cox 1872). Florida Is.
(Eumecostylus) phenax Clapp 1928 San Cristoval Id.

Placostylus (Proaspartus) almirata. Clench 1941 Malaita.
(Proaspartus) galleogoi. Clench 1941 San Cristoval.
(Proaspartus) hargravesi. (Cox 1871) Malaita.
(Proaspartus) kirakiraensis. B Rensch 1934
San Cristoval.
(Proaspartus) sancristovalensis. (Cox 1870)
San Cristoval Id.
(Proaspartus) sancristovalensis. Zilchi. Jaeckel
& Schlesch 1952.
(Proaspartus) uglinosus Kobelt 1891. Malaita.
(Proaspartus) vicinus. B. Rensch 1934. Guadalcanal.
(Proaspartus) scotti (Cox 1873). Ulawa Id.

Placostylus (Placocharis) founaki (Rousseau 1854). Choiseul Ysabel & Treasury Island
(Placocharis) guppyi. Smith 1891. Guadalcanal
(Placocharis) macfarlandi. (Brazier 1875). Malaita
(Placocharis) manni. Clapp 1923. Malaita
(Placocharis) macgillivrayi. (Pfr 1856) Guadalcanal
(Placocharis) palmarum (Mousson 1869) Guadalcanal
(Placocharis) paravicinianus B. Rensch 1934 Guadalcanal
(Placocharis) sellersi (Cox 1871). Guadalcanal
(Placocharis) strangei (Pfr 1855) New Georgia, Vella Lavella
(Placocharis) stutchburyi (Pfr 1860) Russell Island

Placostylus (Santa Charis) hullianus (Iredale 1927) Nendo Id. Santa Cruz Islands

The range of the northern most species P. founaki (Rousseau) is fairly well known. It exists on Choiseul, Ysabel, Fauro and Treasury Islands. There are reports of odd examples being found on Bougainville but there seems no definite confirmation that it lives there. There is little variation in shell shape. The variety paletuvianus (Gassies) differs only in lacking the usual axial colour markings.This is the only species on there northern islands.

The New Georgia group of islands is the home of P. strangei (Pfr 1955) - an arboreal species usually living on vegetation at 1 or 2 metres and relatively common in the northern parts of the main island. There appears to be a lack of records for the south eastern end. This species also occurs on Vella Lavella, Gizo Island and there are early records for Eddystone Island, a volcanic island to the south west.

P gizoensis, Clench, is included here, but seems a doubtful record for the Solomon Islands. It appears identical to P. bivaricosus from Lord Howe Island. See 'Papustyla' 3/92.

1. Type of *Placostylus gizoensis* Clench, 1941
2.3. Examples of *Placostylus bivaricosus* Gaskoin, 1854
4. Figure of *P. bivaricosus* (from Tryon and Pilsbry, Manuel of Conchology).

In 1991 I visited small Gizo Island to check up on this snail. Searches in various bush areas proved fruitless, nor did enquiries at a number of villages produce any likely clues. The villagers were quite familiar with P strangei and the other snails of reasonable size but were quite emphatic that no ground snail like the example of bivaricosus I showed them, lived on their Island.

The type specimens of P. unicus. B Rensch were taken from somewhere in the Marovo Lagoon area, but little seems to be known about this snail or from which nearby land they were obtained. It may possibly be on Vangunu Island which is of reasonable size, bushclad, and fairly high. The landsnail fauna from this island does not appear to have been investigated. The reports of P. stutchburyi (Pfr.) from New Georgia may not be correct, as this is a Russell Island species.

The Florida Islands has P. krefti (Cox) which is quite common. P.artus Clapp is a synonym of this species and was based on an elongated shell and also recorded from here is P.palmarum Mousson but this needs confirmation.

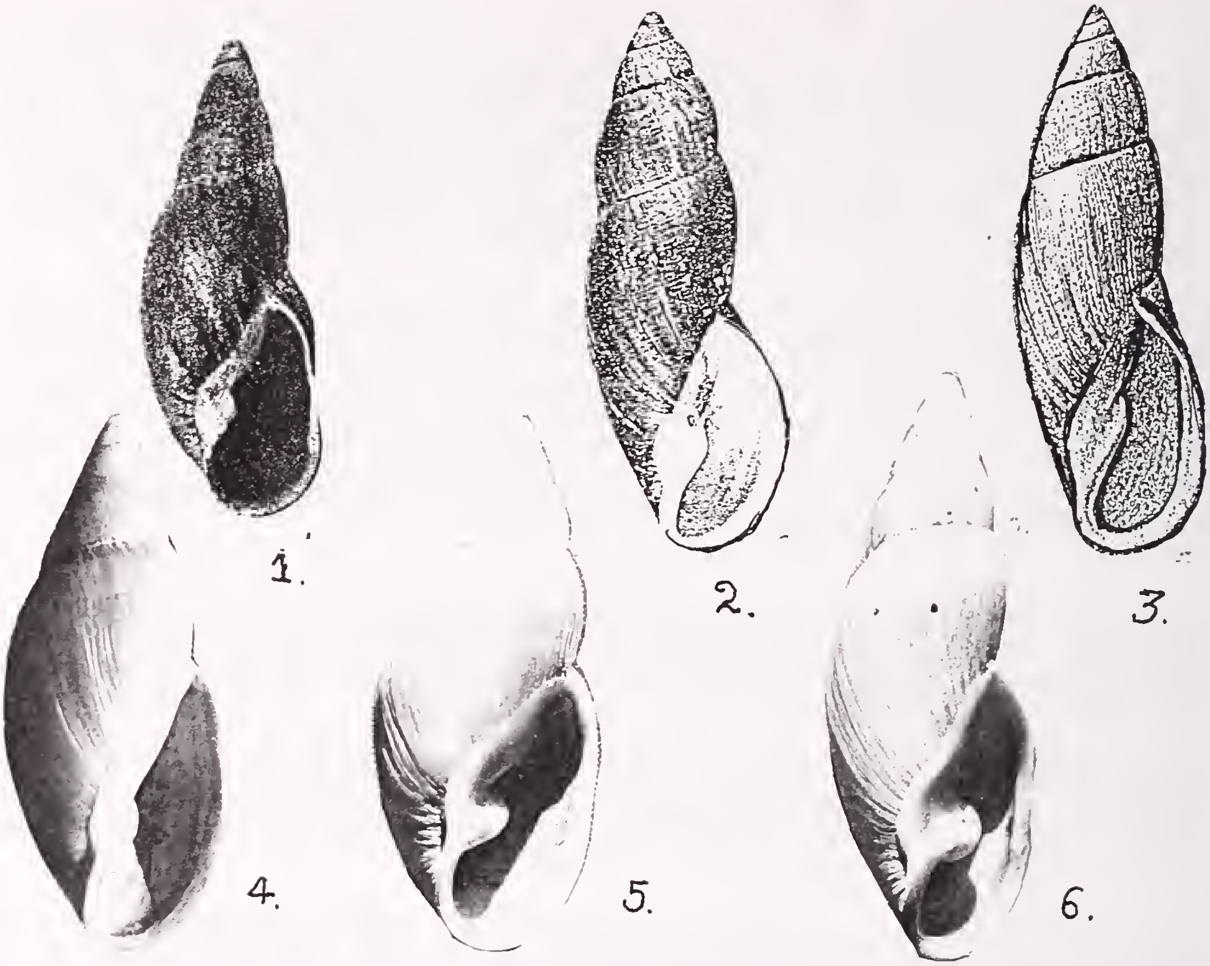
Guadalcanal, one of the larger islands has some nine or ten species but the distributional ranges of these are not well known. Most, however, appear to be concentrated over the more dissected eastern end of the island.

A closer study of P.macgillivrayi (Pfr) and P.palmarum (Pfr.) seems necessary for there is a lack of any clear difference between them. Short spired examples with strong columella processes (as figured for macgillivrayi in Pils. Manual of Conchology) occur randomly with slender specimens over much of the island and on Savo Island. Both Pilsbry and Brazier had some doubts about these two 'species' in their time, and later, so did Clench.

I & B Rensch described and figured the type of P. fraterculus in "Study of the Systematics Solomon Islands" Revue Suisse de Zoo XLII 1935.

Apparently little material was on hand at the time for the specimen they selected as the type was as they stated some what 'unwound'. It was obtained from Domma just west of Honiara and seems to lack the normal apertural configuration. The species does not appear to have a large distributional range, being not uncommon around the Honiara area and on to Mt. Austen directly inland, but there seems to be no published records from further afield.

This specimen illustrated in the American Museum Novitates No 1129 1941 as P.fraterculus is obviously a different species - different in shape and in having weak spiral sculpture, which does not occur in this particular species. It resembles the type figure of P.cylindricus Fulton which was originally considered to be from Ysabel Island but later obtained from Guadalcanal by Dr. Paravicini. I have not come across this species.



1. Type specimen of <u>Placostylus</u> <u>fraterculus</u>. Rensch

2. Specimen labelled <u>P. fraterculus</u> in American Novitates 1129. 1941

3. Type specimen <u>P. cyclindricus</u> Fulton

4. 5 & 6. Variation in <u>P. fraterculus</u> from the Honiara area

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In Tropical Land Snails of the world plate 70, the specimen labelled <u>P. fraterculus</u> would also seem to be <u>P. cyclindricus</u>, having spiral sculpture and distinctive epidermis which is lacking in <u>fraterculus</u>.

On plate 71 of the same publication the figure labelled <u>P. stutchburyi</u> (pfr.) is in fact <u>P. fraterculus</u> which does not occur on Russell Islands.

In the compendium of Land Snails (P.103) the specimen illustrated as <u>P. fraterculus</u> B. Rensch is not this species, being of quite a different shape and appears to have been switched with <u>P. morosus</u> of the Fijian Islands.


SHORTLAND ISLANDS
CHOISEUL (LAURU)
ISABEL PROVINCE
SANTA ISABEL (BUGHOTU)
MALAITA PROVINCE
MALAITA (MALA)
MARAMASIKE
ULAWA I.
NEW GEORGIA ISLANDS
VELLA LAVELLA (MBILUA)
RANONGGA or GHANONGGA
KOLOMBANGARA (NDUKE)
NEW GEORGIA
RENDOVA
TETEPARE
VANGUNU
NGGATOKAE
PROVINCE
CENTRAL PROVINCE
RUSSELL IS.
FLORIDA ISLANDS
SAVO
GUADALCANAL PROVINCE
GUADALCANAL
SAN CRISTOBAI (MAKIRA)
MAKIRA
BELLONA (MU NGIKI)
Sikaiana (Stewart Is)
NAURU IS
KIRIBATI IS
PHOENIX IS
TOKELAU IS
WESTERN SAMOA
TUVALU IS
SOLOMON IS
New Ireland
Santa Cruz
Banks Is.
VANUATU IS
Vanua Levu
CORAL SEA

ILLUSTRATIONS

1. Placostylus (Placocharis) paravicinianus. B Rensch 1934
Marau. Guadalcanal.

2. Placostylus (Placocharis) strangei (Pfr 1855)
Munda. New Georgia.

3. Placostylus (Proaspartus) vicinus. B. Rensch 1934
South Guadalcanal.

4. Placostylus (Placocharis) palmarum (Mousson 1869)
S.W. Coast, Guadalcanal.

5. Placostylus (Placocharis) guppyi. EA Smith 1891
West Coast, South Guadalcanal.

6. Placostylus (Eumecostylus) krefti (Cox 1872)
Gela, Florida Islands.

7. Placostylus (Eumecostylus) calus. EA Smith 1891
Fuabu, North Malaita.

8. Placostylus (Placocharis) manni. Clapp 1923
Ataa, North Malaita.

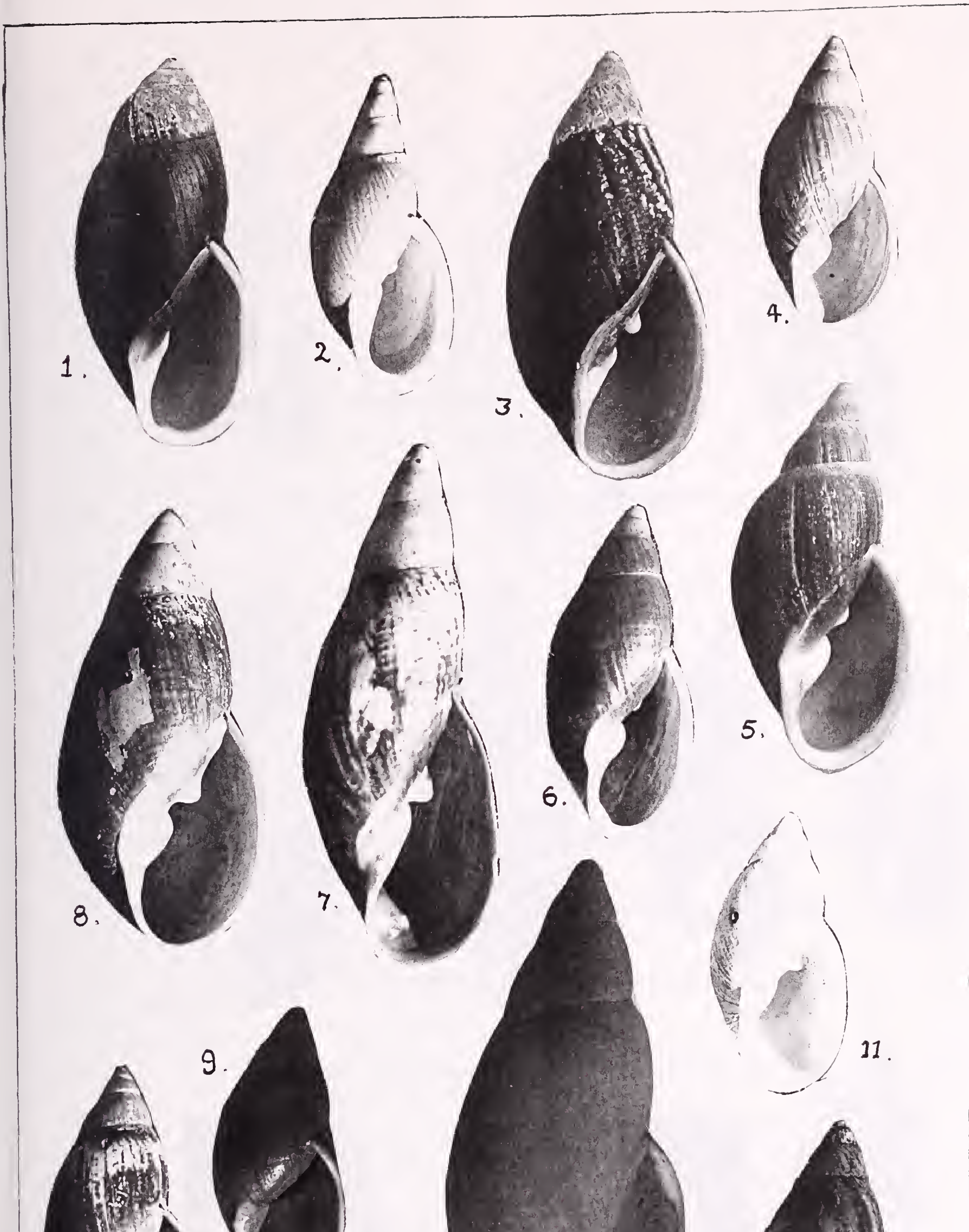
9. Placostylus stutchburyi (Pfr. 1860). Russell Islands.

10. Placostylus (Placocharis) macfarlandi (Brazier 1875)
North Malaita.

11. Placostylus (Proaspartus) scotti (Cox 1873)
Ulawa Island.

12. Placostylus (Placocharis) founaki (Rousseau 1854)
Chirovanga, Choiseul.

13. This appears to be an unnamed species. Three dead shells were obtained from a local islander at Marau, Guadalcanal. A distinctive feature is the sinus on the outer lip, which is not apparent in other Solomon Island species.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1. Placostylus (Proaspartus) vicinus.Rensch 1934. Guadalcanal.

2. Placostylus (Eumecostylus) foxi Clench 1950, Heuru, San Cristoval.

3. Placostylus (Acrostylus) ophir Clench 1941, Sùu, Malaita.

4. Placostylus (Proaspartus) kirakiraensis. Rensch 1934, San Cristoval.

5. Placostylus (Acrostylus) malaitensis, Clench 1941, Sùu Malaita.

6. Placostylus (Proaspartus) gallegoi, Clench 1941, San Cristoval.

7. Placostylus (Proaspartus) almiranta, Clench 1941, Sùu Malaita.

8. Placostylus (Eumecostylus) phenax Clapp 1928 San Cristoval.

9. Placostylus (Proaspartus) uliginosus Kobelt 1934 Malaita.

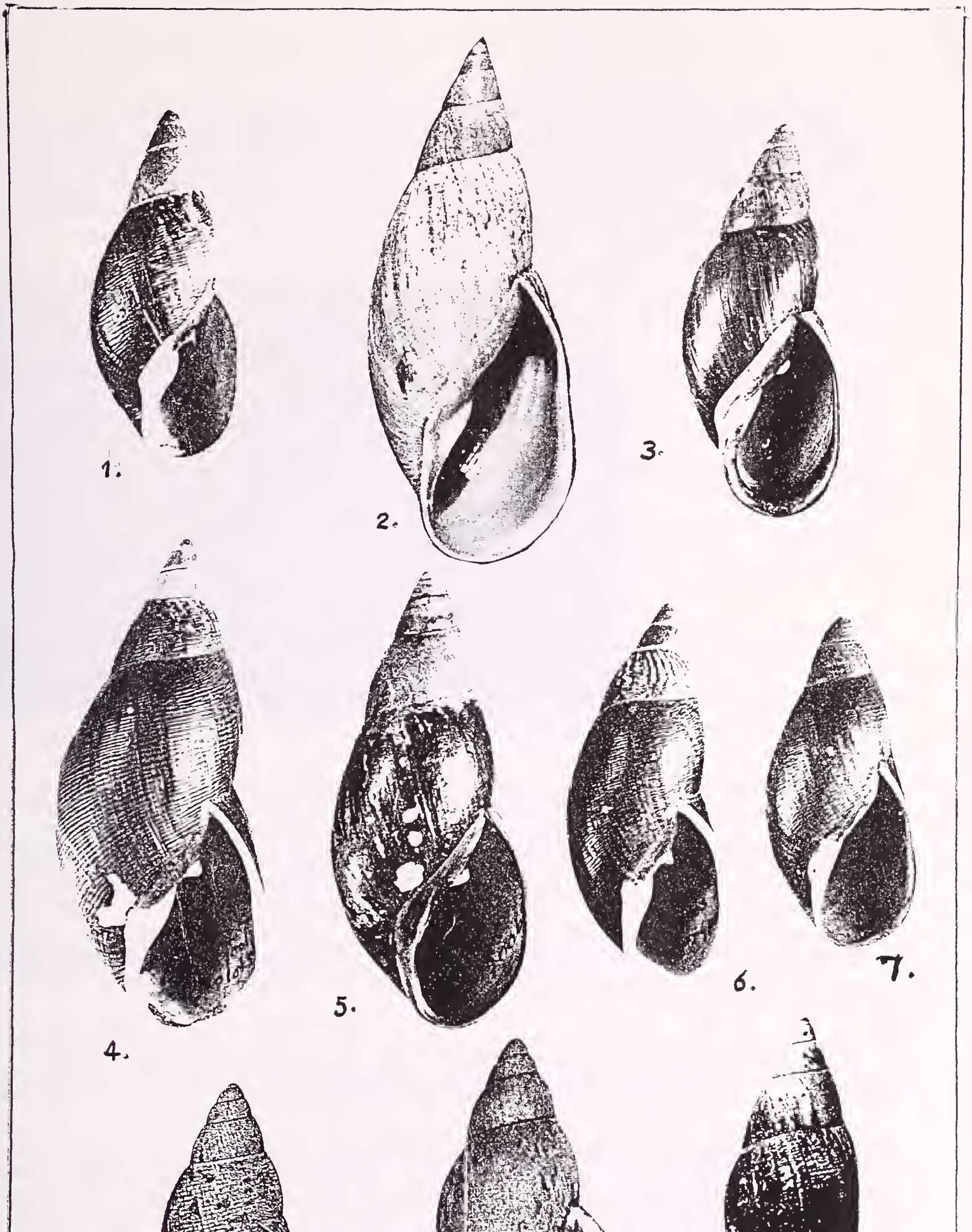
10. Placostylus (Acrostylus) unicus B. Rensch Marovo Lagoon.

11. Placostylus (Placocharis) Sellersi Cox 1871 Marau Guadalcanal.

12. Placostylus (Placocharis) sp. Aola Guadalcanal.

11.

12.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Some eight species have been recorded from Malaita of these the aboreal P. hargravesi. cox occurs quite commonly over much of the Island. Three ground species are known to occur at the western end while the remaining species have been recorded from the central and eastern areas, but the distributional records for these are few. Most of these are from the Whitney expedition of 1929-30 which worked out of Sùu.

P.hargravesi. Cox
Malu. Malaita

The largest species in the Solomon Islands is found on San Cristoval (Makira). This is P.cleryi, (Petit.), specimens of 112 mm in height have been found. It occurs over much of the island, along with the well known white miltocheilus. A number of subspecies have been proposed for this latter snail but differences in some cases seem rather minor. The most distinctive of these is albolabris (Brazier) which has a yellowish shell without the distinctive orange coloured outer lip typical of the species. Nine species and subspecies are recorded for this island.

A small race of P. miltocheilus also occurs on Ulawa Island to the north together with a quite different species P. scotti Cox which appears to be related to hargravesi from Malaita.

P.cleryi clenchi and P.sancristovalensis zilchi, described by Jaeckel & Schlesch from a single specimen in each case, were stated to have been from Gela, Guadalcanal, but Gela is in the Florida Islands. No further examples seem to have been recorded. The extensive collection made by KE Kuntz on Florida Islands during 1943-45 was later worked over by H Solem but no mention was made of these subspecies.

13.

The Santa Cruz Islands which are 400 miles east of San Cristoval has a small species on Nendo Island, which is quite distinct from the other Solomon Island members. This belongs in the subgenus Santacharis and is the northern most species of the Vanuatu group of these snails.

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SURF-CHURNED SESSILE MARINE INVERTEBRATES
- The interaction of moving water on some common New Zealand rocky shore animals.

MICHAEL K. EAGLE

When walking along an exposed rocky coast at low tide, such as that of Motutara, Muriwai, one cannot fail to observe the benthic, sessile, mussel beds of *Perna canaliculus* or the scattered sea anemones and barnacles that are unceasingly battered by merciless waves. Such bottom dwelling organisms live precariously and are always at risk from being ripped-up and surf-churned away by the impacting water, yet they depend on the same water to deliver nutrients, remove wastes and disperse young. Given such a violent ecological niche, what processes enable them to survive?

Perna canaliculus embody a diverse compromise between maximising and minimising the effects of flowing water by lying in crowded sheets through which the surge freely percolates. It is obvious, on examination, that some invertebrate organisms living in a low water flow often possess features that compensate for the lack of transport by moving water, thereby tolerating low levels of oxygen or/and create their own feeding currents. Similarly, a Mytilid mollusc such as *Perna,* living in fast water flows often have features that enhance their ability to withstand and utilise the water rushing past them. The surrounding algae and the byssi of the adult mussels are always heavily loaded with newly settled *Perna,* their shells a couple of millimetres long, pale brown to pearly white and with reddish zigzags. The features that enable such sessile molluscs to attach in one place are varied.

Survival for *Perna canaliculus* depends on how this sessile mollusc deals mechanically with moving water, how the animal's structure affects the flow of water past it; how the flow-induced forces affect it; how the organism's shape determine the stress on its structure when it is subjected to these forces. It is also a question of how does the structural material of *Perna canaliculus* affect the way it deforms or breaks in response to flow-induced stresses (stress is the force or load per cross-sectional area of the material bearing the load (Wainwright et al., 1976))?

Perna canaliculus, like most shore-line marine invertebrates, exist in several basic flow types and there is a major distinction between intertidal and subtidal habitats. Fast, turbulent flows are characteristic of an exposed coast such as Motutara. A measured flow over the byssally attached bivalves at Bartrum Bay found the velocity to be highest during the shoreward surge and seaward backwash immediately after a wave has broken. The shore platform of Bartrum Bay provide the high sub-tidal zone of a wave-swept shore exposed to the back and forth flow rate. When water flowed across the sessile *Perna,* the shape, size and texture affect the magnitude of the mechanical forces exerted on it. The viscosity of the water produces drag forces which tend to push the mollusc downstream. A

boundary layer of water "sticking" to a bivalve is subjected to shearing forces as the flow passes by. Since water is viscous and resists being sheared, skin-friction drag for the mollusc results. The drag magnitude is proportional to the velocity of the flow and the length of the mollusc and therefore becomes larger as the valves increase in size or encounter faster flows . It appears that drag on small bivalves in a slow flow is mainly due to skin friction. Large bivalves in a fast flow are affected by an additional drag, stronger than skin friction; a turbulent wake forms on the downward side of the bivalve. The pressure on the upstream side is greater than that on the downward side, pushing the bivalve downstream. Any external feature of a bivalve that reduces the size of the wake will automatically reduce form drag. It is a known fact that the magnitude of form drag is proportional to the area of body and the square of the velocity (Wainwright et al., 1976). Therefore, a comparatively large increase in drag form may be achieved simply by a small increase in either length or water velocity.

Shape, surface texture and flexibility affect drag forces and flow patterns around similar organisms that differ in particular characteristics (Vogel, 1981). Patterns of flow around mats of *Perna Canaliculus* were visualised with dye and flowing coloured twine. It was noted that a large mussel with most of its surface parallel to the flow, creates a smaller wake (reducing form drag), than one at a right angle to it.

This simple way of reducing drag is also illustrated by the forces subjected on two species of Actiniaria found where sand accumulates between mussel clumps and in rock depressions: the colourful, large and broadly spreading sand-covered sea anenome *Isocradactis magna* and the orange and white or pale green striped column of *Actinothoe albocincta*.

Isocradactis magna has a buff or cream column covered with small warts, short, blunt tentacles, a large disc thrown into four undulating lobes, and immediately outside it, finely branched acrorhagi that form a fine white ruff. *Actinothoe albocincta* has a fluted crown of moderately long tentacles for catching zooplankton. The fluffy anemone lives subtidally, where the slow tidal currents aid food filtering by bending its crown over at right angles to the flow. In contrast, most of the surface area of *Isocradactis magna* stands parallel to the flow. At a given velocity both the size of the wake and the amount of drag are greater on a fluffy anemone such as *Actinothoe* than they are on *Isocradactis* with the same crown diameter. Tentacles of both flexible Actiniaria are pushed together as each is pushed over by flowing water. The movement aligns the anemones more parallel to the flow, reducing drag and the size of the wake. Faster flowing water induces the tentacular crown of *Actinothoe* to collapse, like an umbrella turning inside out. This passive change of shape significantly reduces drag.

Sessile marine organisms such as the barnacle *Balanus amphitrite* can also be subjected to lift forces. The water flowing over the curved top surface of the arthropod travels faster than the water flowing over other plate surfaces. The pressure in the fast-flowing area is lower than that of other regions; the result is a force that tends to lift the organism off the substrate. Similarly, the ovate shape of the organism causes water to flow around one side of it faster than around the

other side, causing the animal to be pulled toward the side where the flow is faster.

Common to all invertebrates mentioned so far is another force, the acceleration reaction. Water speeds up, slows down and changes direction regularly around these animals over which waves break. Acceleration reaction forces an organism in the direction that the water is accelerating; the greater the volume of water that must be accelerated to pass around an organism, the stronger seems to be the acceleration reaction. Tightly packed, wave-swept *Perna* entwined together in byssal matts are perhaps constrained not only by substrate space, available food supply and subsequent growth rates, but also by acceleration reaction forces limiting adult size.
This may be subtly achieved by restricting the time that *Perna* has to actively feed and by requiring the species to grow a thicker shell structure in order to survive wave generated impact energy.

Any of the above invertebrates may be broken or ontogenetically deformed due to flow-induced forces. The magnitude of stress (force per area) on hard skeletal structures or soft tissues decides the appropriate organic response. Size and shape determine stress magnitude in an invertebrate when bearing a given load such as drag force; an organism may endure the load in many ways, including twisting, shear, tension and bending. Ecological damage such as partial predation, parasitism, or disease, may sufficiently weaken an animal to the point where stress surpasses strength and breakage, possibly fatal, occurs.

The extent to which an organism deforms in a water flow of a particular habitat has an important effect on its abilities and the success of its daily activities. Can the mesoglea of a sea anemone passively stretch and withstand the duration of surge and tidal currents as well as keep its tentacles in food particle catching configuration? Is a barnacle able to cement itself to the substrate securely enough and be resilient in genetic morphology to withstand the magnitude of different stresses for the duration of its life and still filter feed, grow, and reproduce? A weakling invertebrate stressed to breaking point will snap at a lower stress than normal; should the attached bysall threads of Perna be severed, the mollusc is wrenched from the bed and the valves shattered.

The natural equation of shear, tensile, compressive, torsional and bending stresses is incessant in its formulation. These physical disturbances are important, intangible factors in most marine organisms being able to withstand and utilize fast moving water. These phenomenon must affect the organism diversity of sessile communities in such a high-energy environment as the exposed rocky shoreline of Motutara, Muriwai, West Auckland.

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FIGURE CAPTIONS

FIG.1 Schematic depiction of *Perna canaliculus* showing water flowing around the widest section of the valves increasing in velocity but decreasing in surface pressure; induced eddying wake a response of turbulent boundary layer

FIG.2 Schematic depiction of showing a fast water flow moving with respect to *Perna canaliculus,* with the boundary layer becoming turbulent and momentum being transferred to it from the mainstream flow, producing a smaller wake and reduced form drag.

FIG.3 Schematic depiction of water moving along the top or one side of *Balanus amphhitrite* faster than over plates elsewhere producing a low pressure area that tends to suck the body upward or sideways. This force, although here called lift, may be at any right angle to the flow and not always upward.

FIG.4 Mainstream flow in a surge channel showing variations of flow around sessile anemones. Mainstream flow is often up to 5 metres per second as waves break on the shore and the water then retreats.

FIG.5 *Isocradactis magna* assumes a flattened shape to take advantage of the lower velocity of flow near a surge channel bottom. Maximum drag on the sea anemone is exerted when the water velocity peaks; the maximum acceleration reaction force is exerted when the acceleration is greatest.

FIG.6 *Isocradactis magna* extends further into the flow where seaward rocks bear the brunt of the waves; flow past rate is much the same as anemones in the surge channel.

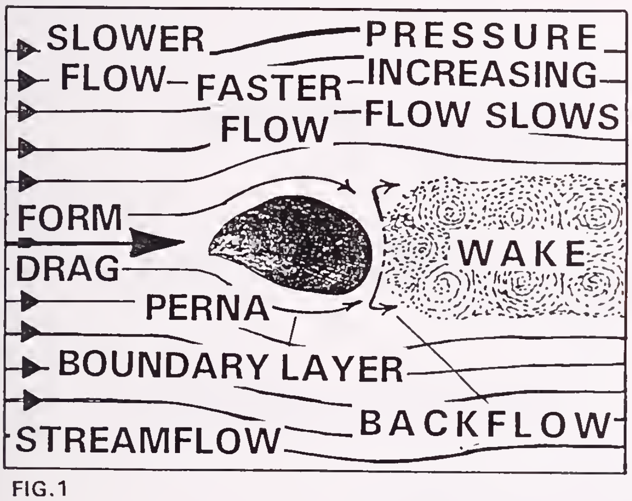


FIG.1

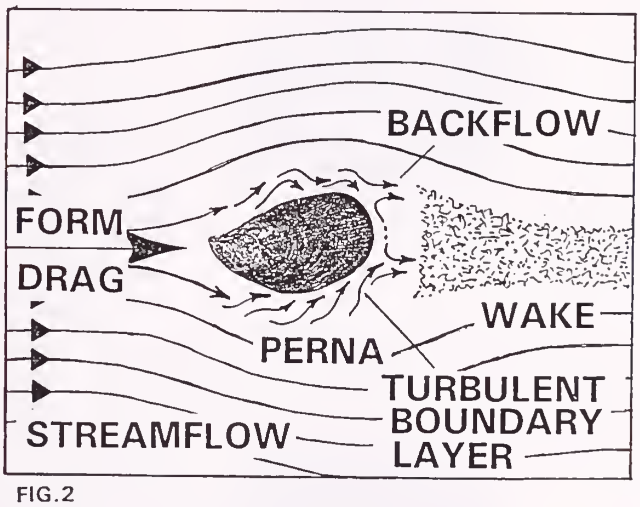


FIG.2

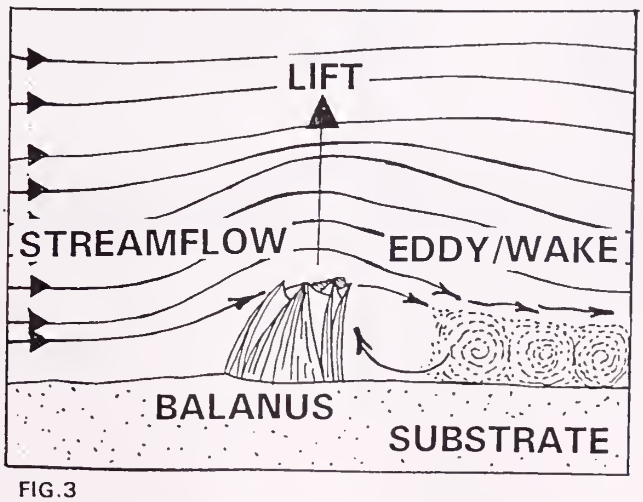


FIG.3

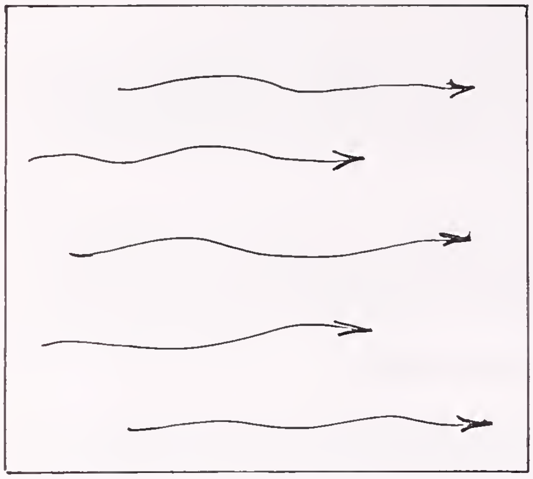
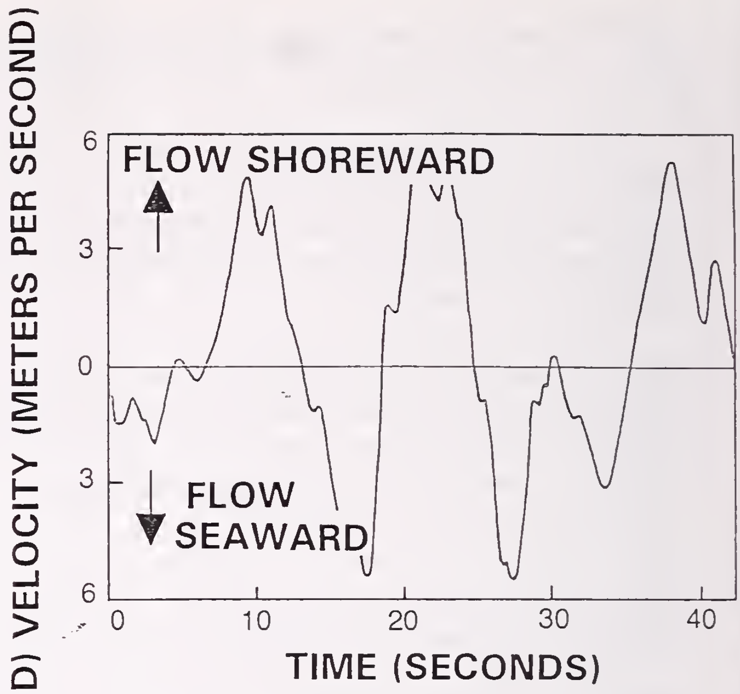


FIG.4



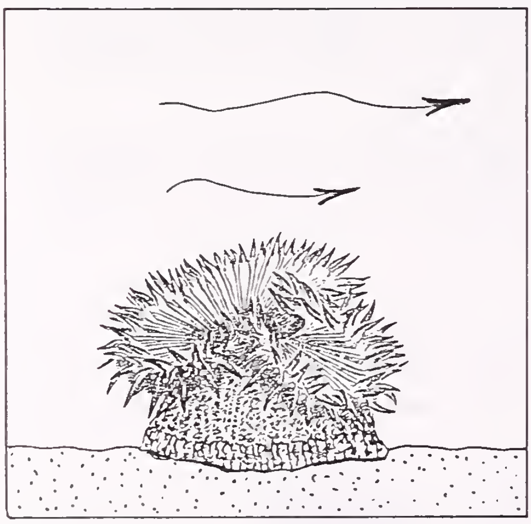
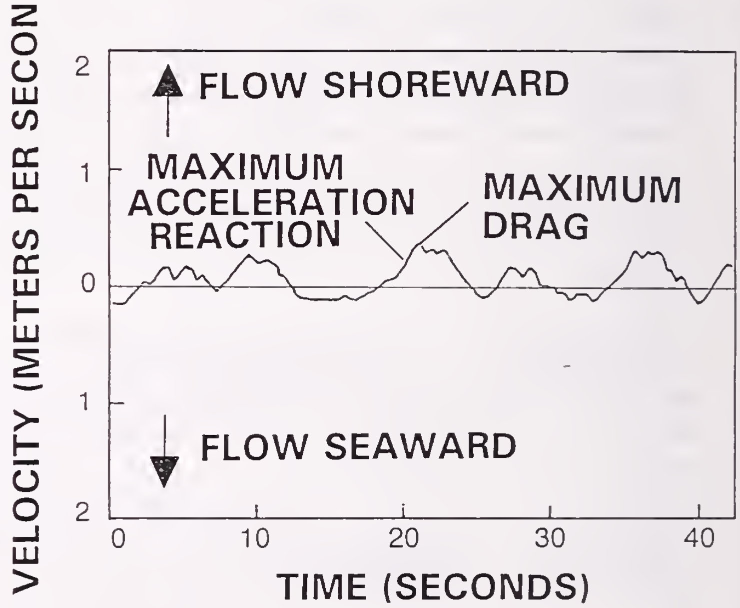


FIG.5



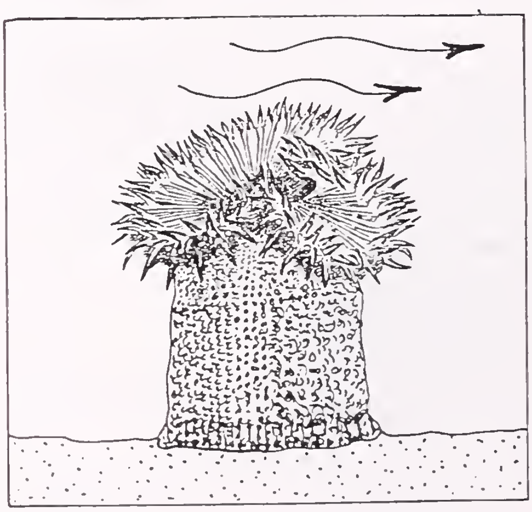
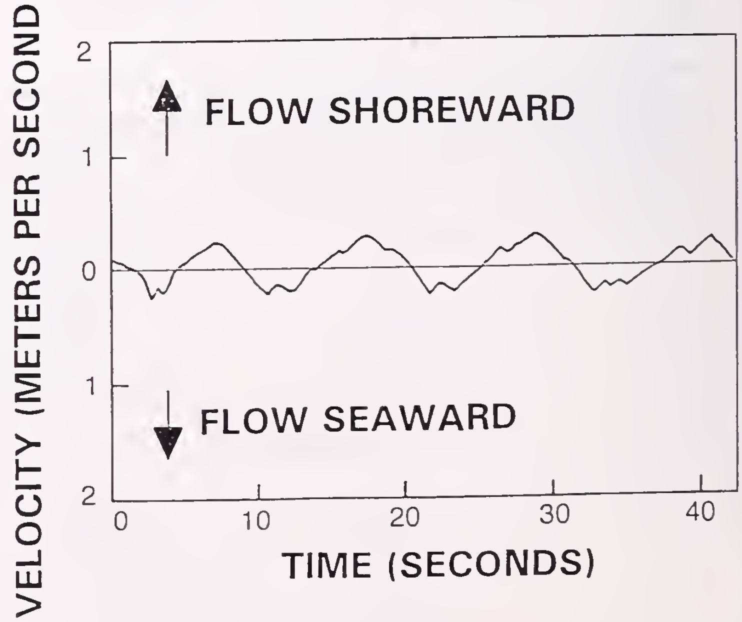


FIG.6

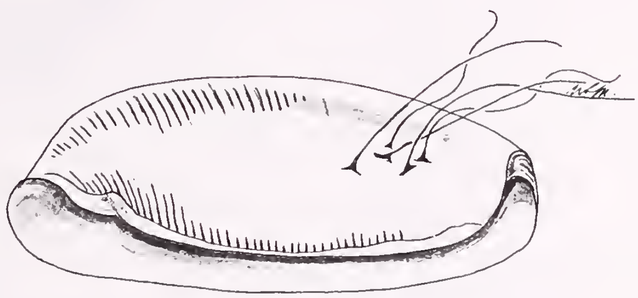


SHELLS COLLECTED FROM THE BYSSAL THREADS OF THE GREEN SHELL[1] MUSSEL *PERNA CANALICULUS* (Gmelin 1791)

by Bruce F. Hazlewood

In August 1985 there was a wash up of tangled byssal threads between Waikanae and Paraparaumu on either side of the Waikanae River mouth. These were left on the high tide line. When examined they were found to have small shells attached! A collection of this debris was made and sorted out later. The following quantities were collected.
Approx. 1 Bucket, Waikanae River Mouth to Paraparaumu. Hazlewood, 10/8/85
Approx. 1 Bucket, Waikanae River Mouth to Waikanae Beach. Hazlewood & Nehu Te Wiata, 18/8/85.
Gracie Davies from Paraparaumu also sampled this material. She had found one specimen of *Phenatoma zelandica* (E.A.Smith, 1877) which was in addition to my list.

All specimens were in a rough condition displaying glue attachment of byssal threads. A large proportion of the species present were heavily predated by boring molluscs. What caused this boring is a mater of speculation. The muricid family, well known predators, in particular *Muricopsis octogonus* (Quoy & Gaimardi 1833) live in this area, usually on hard substrate. The commonest gastropod present, *Tanea zelandica* (Quoy & Gaimardi 1832), lives in sand and is a boring predator. *T. zelandica* were themselves heavily predated by boring, approx. 48% of those collected. Octopus[2] is another possibility.



Cylichna zealandica T.W.Kirk, 1880
Height 9mm Width 3.8mm
With byssal threads attached

[1] Commercial interests have requested that the common name of the species *Perna canaliculus* be changed to the Green Shell Mussel. A name change worked for kiwifruit and tamarillos! Ed.

[2] See Enderby 1979

The Green Shell Mussel, anchors itself to the sea bottom using byssal threads which stick to any surface they encounter. Shells trapped in this way indicate the faunal associations. The large numbers found of species such as *Myadora striata*, *Antisolarium egenum*, *Tanea zelandica*, *Duplicaria tristis,* the Amaldas and highest of all, 1462 valves of *Scalpomactra scalpellum* suggest a depth range of 6 metres to 12 metres in a substrate ranging from sandy to silty near the Waikanae River mouth. Valves of *Dosinia subrosea* (Gray 1835) were more common than *Dosinia anus* (Philippi 1848). I have also noted greater numbers of *D. subrosea* washed up near the river mouth. A shallow burrower into the substrate, this could be an indicator of the depth and substrate preferences of the two species. *Alcithoe* are common in the area.

Specimens of *Duplicaria (Pervicacia) tristis* (Deshayes 1859) were closely examined when checking for the elusive *D. (P.) propelevis* (Ponder 1968). The type locality is Waikanae beach. Some examples were quite narrow, but were not as slender as *D. (P.) propelevis* when compared with the paratypes.

The paratype material, 4 specimens from the Museum of New Zealand, are very beach worn, chalky and acutely slender. Is *D. (P.) propelevis* only an extreme form of *D. (P.) tristis?*

Philine powelli Rudman 1970
Height 6mm Width 4.5mm

Zeacolpus (Stiracolpus) blacki Marwick 1957
Height 27mm Width 6.5mm

WAIKANAE SPECIES LIST			
GASTROPODS	AUTHOR	Number	Drilled
Alcithoe arabica	Marwick 1926	12	
Amalda (Baryspira) australis	Sowerby 1830	50	6
Amalda (Baryspira) depressa	Sowerby 1859	27	2
Amalda (Gracilispira) novaezelandiae	Sowerby 1859	4	8
Antisolarium egenum	Gould 1849	140	
Austrofusus glans	Roding 1798	20	
Cantharidiella tesselata	A. Adams 1851	1	
Cylichna zelandica	T.W.Kirk 1880	5	3
Duplicaria (Pervicacia) tristis	Deshayes 1859	102	16
Maoricolpus roseus roseus	Quoy & Gaimar 1834	2	
Maoricrypta (zeacrypta) monoxyla	Lesson1831	8	
Microlenchus tenebrosus	A. Adams 1851	1	
Neoguraleus sinclairi	Gillies 1882	7	
Penion sulcatus	Lamark 1816	1	
Phenatoma rosea	Quoy & Gaimar 1833	1	
Phenatoma zelandica	E.A.Smith 1877	1	
Philine powelli	Rudman 1970	2	
Struthiolaria papulosa	Martyn 1784	1	
Tanea zelandica	Quoy & Gaimar 1832	205	97
Turbo smaragdus	Gmelin 1791	1	
Zeacolpus (Stiracolpus) blacki	Marwick 1957	31	
Zegalerus tenuis	Gray 1867	10	
Zethalia zelandica	Han & Jac	4	
BIVALVES			
Bassina yatei	Gray 1835	12	4
Corbula (Anisocorbula)zelandica	Quoy & Gaimar 1835	1	
Divaricella (Divalucina) huttoniana	Vanatta 1901	3	
Dosinia (Austrodosinia) anus	Phillipi 1848	8	2
Dosinia (Phacosoma) subrosea	Gray 1835	50	2
Gari lineolata	Gray 1835	16	
Hiatella arctica	Linnaeus 1767	2 + 3	
Mactra murchisoni	Deshayes 1854	1	
Myadora boltoni	E.A.Smith 1880	25	5
Myadora striata	Quoy & Gaimar 1835	96	29
Nucula nitidula	A. Adams 1853	52	3
Ostrea lutraria	Hutton 1873	1	
Paphies subtriangulata	Wood 1828	1	
Perna canaliculus	Gmelin 1791	2	
Resania lanceolata	Gray 1852	2	
Ruditapes (Paphirus) largillierti	Philippi 1849	1	
Scalpomactra scalpellum	Reeve 1854	1462	60
Soletellina nitida	Gray 1843	4	
Spisula (Crassula) aequilateralis	Deshayes 1854	2	
Tellina (Tellinella) huttoni	E.A.Smith 1885	1	
Zenatia acinaces	Quoy & Gaimar 1835	1	
SCAPHOPODA			
Dentalium nanun	Hutton 1873	3	

Notes of interest:

1. No chiton valves were found.
2. No valves of *Glycymeris* were found. There are vast beds of *Glycymeris* near Kapiti Island.
3. No evidence of *Chlamys* in the samples. *Chlamys* is very common in the channel between Kapiti Island and the mainland, living in sponge.
4. Bored holes on the *Myadora* species are commonly on the curved valve which is the lower valve when in life position in the sand.
5. The *Amalda* species are drilled from the underside.
6. No specimens of *Amalda mucronata* (Sowerby, 1830) were encountered.
7. Only one valve of tuatua *Paphies subtriangulata* was found.
8. Members of the Naticidae are active carnivores, feeding largely upon small bivalves. They bore into their shells, with the aid of the radula and an acid secretion. The proboscis is then inserted through the hole.

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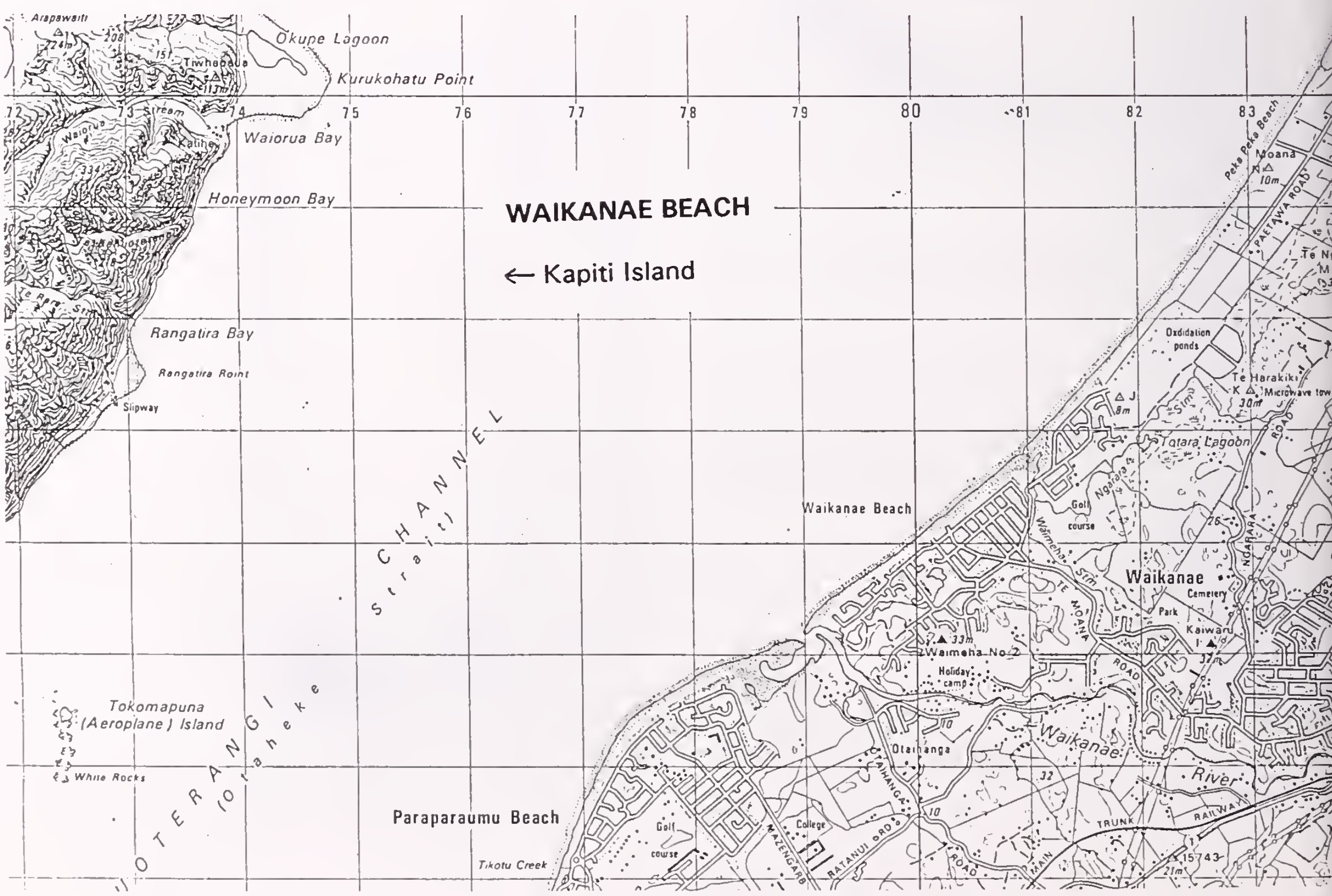
Acknowledgment: Thanks to Margaret Morley for editing advice and illustrations.



Larochella, Powell, 1927

by Margaret S. Morley

Summary:
Differences between *Larochella alta* and *L. toreuma* are discussed. An extension of range is recorded for both species.

Introduction:
The genus *Larochella* is in the gastropod family Aclididae.
During an Auckland Museum field trip in June 1993, a freshly dead specimen of *L. toreuma* (Fig. 1) was found in shell sand and algae taken from the interface of the boulder beach and sand at Kawerua on the West Coast of Northland. Shell height is 1.9mm, width 0.7mm.

The difficulties of deciding whether this specimen was *L. alta* or *L. toreuma* led me into looking at more specimens of both species.

Specimens Examined:
Larochella alta
1. Holotype AK 72075, held at Auckland Museum, from Mangonui, North East Coast of Northland. Depth 11 - 19 metres.
2. Five paratypes AK 71520, held at Auckland Museum.
3. Six lots in the Auckland Institute and Museum collections:-
   Doubtless Bay, Northland. 24metres. 12 specimens.
   Awanui Bay, Northland. 24 metres. 14 specimens.
   Off Owenga, Chatham Islands. 20 metres. 3 specimens.
   Poor Knights shell sand. 30 metres. 4 specimens
   Mangonui, Northland. 20 metres. 10 specimens.
   Off Hen & Chickens Islands, Hauraki Gulf. 48 metres. 1 specimen.
4. Four lots in the collection of the author:-
   Poor Knights. 40 metres. 1 specimen.
   Karikari Peninsula, Northland. 23 metres. 7 specimens.
   Abercrombie, Great Barrier Island. 17 metres. 1 specimen.
   Mercury Passage. 30 metres. 8 specimens.
5. Two lots in the collection of Nancy Smith:-
   Waitangi shell sand, Chatham Islands. 1 specimen.
   Kaikoura Island shell sand. Great Barrier Island. 2 specimens.

Larochella toreuma
1. Holotype AK 72076, held at Auckland Museum, from Houghton Bay, Cook Strait. Algal wash.
2. Two paratypes AK 71519, both juveniles, held at Auckland Museum.
3. One lot in the collection of the Museum of New Zealand.
   Cook Strait. Algal wash. 5 specimens, 4 of them juvenile.

FIG. 1.
FAMILY: Aclididae
SPECIES: *Larochella toreuma* Powell, 1927
LOCATION: Kawerua, West Coast, Northland, shell sand and algae
DATE: 29th June 1993
SIZE: Height, 1.9mm, Width, 0.7mm.
COLOUR: Tranparent white.
COLLECTION: Auckland Museum

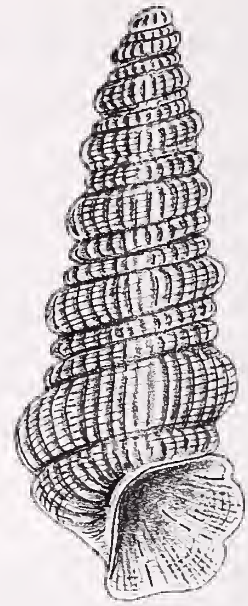


FIG. 2.
Outline drawing of *Larochella toreuma* in Powell 1979, Pl. 28.

FIG. 3.
Outline drawing of holotype of *Larochella toreuma*.

Discussion of Shell Features:

1. Proportions:

Powell (1979) says that *L. alta* is wider in relation to height than *L. toreuma*. His diagram exaggerates the narrower proportions of *L. toreuma* especially the curve of the body whorl. (Fig. 2 & 3). In the Kawerua specimen the proportions are the same as the *L. alta* holotype. Proportions for the other specimens of *L. alta* examined are variable.

2. Protoconch:

Powell (1979) says that *L. alta* has a proportionally smaller and more depressed protoconch than *L. toreuma*. This is the case when comparing the holotypes, however the other specimens of *L. alta* examined show the size and depression of the protoconch to be variable, both between lots and between specimens of the same lot.

3. Spiral keels:

Powell (1979) used the presence of the third spiral keel to distinguish *L. toreuma* from *L. alta*, but this third keel appears to be weak on the holotype. The holotype of *L. toreuma* is now in poor condition with surface damage. The two paratypes are juveniles. The holotype of *L. alta* has two spiral keels, but a few of the other *L. alta* specimens examined have three keels, making this an unreliable distinguishing feature.

The Kawerua specimen has three prominent keels on all but the first two postnuclear whorls.

4. Axials:

the holotype of *L. toreuma* has 16 axials on the body whorl. The holotype of *L. alta* has 19 - 20 axials. The Kawerua specimen has 28 - 30 axials.
The average number of axials on the specimens of *L. alta* examined is 22, ranging from 19 - 24.

5. Microscopic Striations:

These are present over the whole of the postnuclear surface in all undamaged specimens of *L. alta* and *L. toreuma* examined.

6. Size:

Powell (1979) says *L. alta* is larger than *L. toreuma*. The holotype of *L. alta* measures 1.6mm in height and 0.6mm in width. The holotpye of *L. toreuma* is 1.25mm in height and 0.5mm in width. However the Kawerua specimen is 1.9mm in height and 0.7mm in width.

Algal Wash:

It was not recorded on which seaweed species the type specimens were found in 1927. In February 1992 a juvenile specimen of *L.* sp. was collected by the Auckland Museum by washing the algae *Pachymenia himantophora* at a depth of 1-3 metres in Matai Bay, Karikari Peninsula, Northland. Although this may not be the only species of algae *Larochella* lives on, it seems worthwhile to examine further samples of this algae.

Discussion:

The specimens examined do not consistently show the described differences of the shell between *L. alta* and *L. toreuma*. The preceeding variable features suggest that there is only one species of *Larochella*. The variations are possibly due to geographical factors. If mature, live specimens are found further study on the animal is needed. Any material obtained from algal washings in the Cook Strait area would be appreciated.

The specimen from Kawerua is an extension of range for *L. toreuma* and the Chatham Island specimens an extension of range for *L. alta*.

Acknowledgments:
My thanks to Dr Bruce W. Hayward for suggesting improvements to the manuscript and for making the type specimens available; Bruce Marshall for the loan of *L. toreuma* specimens from the Museum of New Zealand; Nancy Smith for the loan of the *L alta* specimens from her collection.

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POIRIERIA TWENTY YEARS AGO.

N.W.Gardner reported "On the Occurrence of a Species of *Hipponix* from Northern New Zealand" These were tiny dead shells dredged from 25 fathoms close to Tawhiti Rahi in the Poor Knights Islands.

Another article lists some of the species found when Aucklanders jumped off the end of Kings Wharf fully clothed to collect shells from the spoil dredged from the Rangitoto Channel and dumped during reclamation work. These included *Glaphyrina vulpicolor, Murexul octogonus, Tellinella charlottae and Maurea Pellucida* among the less common species. The size of shells was considered "far in excess of anything we see washed up on local beaches" and *Baryspira mucronata* were "many in very good condition and very much bigger than anything we see from our own dredging efforts"

I have not updated the generic names as it is interesting to see the genera that were in use then. Nancy Smith.

SYRINX ARUANUS

by **Frank Boulton**

This article presents the facts surrounding the recent discovery of a specimen of *Syrinx aruanus* on the beach at Onetangi Bay, Waiheke Island, Hauraki Gulf, New Zealand. A description of the species is given. Five hypotheses are presented to explain the origin of the specimen. The purpose of these hypotheses is to ensure that all data about the find are recorded. Then the facts about the specimen and its discovery are presented. The five hypotheses are then evaluated.

DESCRIPTION OF SYRINX ARUANUS

Syrinx aruanus(**Linnaeus**, 1758), of the family **MELONGENIDAE**, is reckoned by some authorities to be the world's largest living gastropod, reaching sizes of up to 75cm. It is noted for the great length of its protoconch, which is usually broken off before the animal reaches maturity and consists of some five and a half whorls with constricted sutures and axial ribs. The shell is fusiform. The whorls are strongly keeled with the keel of each whorl slightly overhanging the succeeding whorl. The body whorl often has a second, less prominent keel. The whorls are concave on either side of the keels. All whorls have weak spiral ribs of varying widths, crossed by weak vertical ridges. Later whorls tend to be nodulose at the shoulder. The suture is deep. The lip is finely ridged but it is most often jagged, as the shell is remarkably thin and frail for such a large species. The aperture and columella are smooth. It has an extended, open, almost straight siphonal canal. The umbilicus is a deep, narrow slit. The shell is apricot-coloured both externally and internally and is covered with a thick, coarse, flaky, brown periostracum, which is easily removed.

The animal is bright yellow and is a voracious carnivore feeding mainly on other mollusca.

The female lays a string of white, sectioned egg capsules. These are attached to the substrate or any other suitable object. Each capsule contains several hundred eggs, of which only twenty to fifty hatch, the rest being *nurse-eggs* to feed the young. The young emerge from their eggs as small snails.

It is a North Australian(from Bunbury, West Australia to southern Queensland) and New Guinean species and is now protected by law in Australia, having been over-collected in recent years. It occurs from low tide down to about 60 meters. It is commonly found on mud flats. Shells from the northern end of the range have a high-shouldered spire and the shoulders are keeled, sometimes nodulose. Shells from the southern end of the range in West Australia have a low, straight-sided spire and rounded shoulders.

Australian Aborigines and inhabitants of the central Pacific use this shell as a water carrier. The animal's large foot is edible. Its remains are found in vast quantities in Aboriginal middens. Taiwanese prawn fishers often land this species. They process the meat and then sell the shells at lower prices than Australian dealers. Offshore fishing bans have not deterred them. The fact that the species is poached and smuggled may be relevant to the finding of a single, fresh specimen in New Zealand.

POSSIBLE ORIGIN OF THE SPECIMEN

Five explanations of the origin of the specimen spring to mind. They are:-

1) that *Syrinx aruanus* has recently extended its range to include some of the waters around New Zealand;

2) that the range of *Syrinx aruanus* is greater than has been recorded up to now and includes some of the waters around New Zealand;

3) that the specimen was transported by natural means from its normal range to Onetangi;

4) that the specimen was transported accidentally from its normal range to Onetangi, either totally or in part, as a result of human activity; and

5) that the specimen was deliberately placed on the beach at Onetangi.

THE CIRCUMSTANCES OF THE FIND

The days preceding the field trip to Waiheke Island brought very rough weather to the Hauraki Gulf. On Tuesday 5 July 1994, there were very strong gales, which became particularly ferocious during the night. The weather on Wednesday 6 July 1994 was just as rough. Thursday was still quite stormy. There were strong winds during the morning of Friday 8 July 1994, which had a predominantly westerly direction at the time of the find, and there was some rain, quite heavy at times, which, no doubt, kept many people off the beach. Meteorological data for the day of discovery and preceding days are summarized in the table below:-

Date	Average wind speed	Prevailing wind direction
Monday, 4/7/94	12km/hr	south-westerly
Tuesday, 5/7/94	26km/hr	north-westerly
Wednesday, 6/7/94	50km/hr	westerly
Thursday, 7/7/94	62km/hr	westerly/north-westerly
Friday, 8/7/94	40km/hr	westerly

The New Zealand Herald for Thursday 7 July 1994 reported violent weather conditions. Winds of up to 120km/hr were recorded in the Auckland and Waikato regions.

The beach was very different from usual. *Umbonium zelandicum* were even more abundant than usual. Live *Struthiolaria papulosa* also get washed ashore there in huge numbers but on this day they seemed to be absent. A number of the other species on the beach at Onetangi that day were new to the present author at that location.

At about 9.15a.m., the specimen of *Syrinx aruanus* was found. About a meter away was another magnificent find, a large *Penion cuvieranus cuvieranus*(**Powell**, 1927), dead and without operculum but otherwise in very good condition. Other finds of the day paled into insignificance but some of them might be useful in trying to explain the presence of *Syrinx aruanus* on a New Zealand shore.

LOCATION AND ENVIRONMENT

The specimen lay just above the drift line. This is consistent with the way, in which the tide deposits material. The incoming waves push objects up the beach, they break, thus loosing energy, and then the water ebbs back down the beach. The gentler return movement cannot carry such heavy objects. So, larger objects *tend* to be deposited higher up the beach than smaller ones. This would be *consistent* with the specimen's deposition by the tide rather than by human agency. It also lay upon untrodden sand. Both specimens were surrounded by depressions in the sand on the three sides not facing the water.

DESCRIPTION OF THE SPECIMEN

Length 24.95cm, width 9.9cm. The specimen, although not of gem quality, is in remarkably good condition. There was no trace of flesh within the shell. There was no noticeable odour of putrefaction, although the collector did not check for this at the time of the find. The greater part of the periostracum is worn away but substantial patches of it remain especially on the spire and inside the umbilicus. Very little

periostracum remains on the body whorl. The protoconch is absent. There a little encrustation on the earliest five whorls. The outer lip and the lip along the umbilical slit are jagged. The colour is still fresh and bright, being the normal apricot colour of this species. The areas of the shell denuded of periostracum retain their glaze, there being little sign of erosion or pitting. The specimen was only given a rinse in clean water.

TIDAL AND METEOROLOGICAL INFORMATION

The tide was receding at the time of the find, the last high tide being at 6.32a.m. For meteorological data see the table above above.

OTHER SPECIES

Other species observed at Onetangi Bay on the day of the discovery may provide a clue to the origin of the specimen. They are listed below, with species not previously encountered by the collector at that locality indicated in bold italics. Samples of species preceded by an asterisk were collected.

Anomia trigonopsis **Hutton**, 1877
Bassina yatei (**Gray**, 1835) [Single valves.]
Cellana ornata (**Dillwyn** ,1817)
Cellana radians* (Gmelin**, 1791)
Chlamys zelandiae* (Gray**, 1843)
****Chlamys zelandiae(zeelandona form)*** (**Hartlein**, 1931)
Cominella adspersa* (Bruguière**, 1789)
Cominella glandiformis (**Reeve**, 1847)
Divaricella huttoniana* (Vanatta**, 1901) [Found much further west on the beach than previously by the collector.]
Dosinia anus* (Philippi**, 1848)
Dosinia subrosea* (Gray**, 1835)
Gari lineolata* (Gray**, 1835)
Gari stangeri* (Gray**, 1843)
Glycymeris laticostata (**Quoy and Gaimard**, 1835) [Single valves.]
Glycymeris modesta (**Angas**, 1879) [Single valves.]
Macomona liliana* **Iredale, 1915
Maoricrypta costata* (Sowerby**, 1824)
Myadora striata* **Quoy and Gaimard, 1835
****Panopea zelandiae*** **Quoy and Gaimard**, 1835 [One single valve.]
Paphies subtriangulata* (Wood**, 1828)
Paphies ventricosa (**Gray**, 1843) [Single valves.]
Pecten novaezelandiae* **Reeve, 1853
****Penion cuvieranus cuvieranus*** (**Powell**, 1927)
Penion dilatatus* (Suter**, 1913)
Purpurocardia purpurata (**Deshayes**, 1854)
Struthiolaria papulosa (**Martyn**, 1784) [Live specimens usually abundant. The collector failed to find any live specimens but there were a few long dead ones.]
Tawera spissa* (Deshayes**, 1835)
****Tellina gaimardi*** **Iredale**, 1915
Umbonium zelandicum* (Hombron and Jacquinot**, 1855)

SHIPPING MOVEMENTS

During the week preceding the find there arrived at the Ports of Auckland and Tauranga a number of ships, which would have passed through the normal geographical range of *Syrinx aruanus*.

NUMBER OF SHIPS PASSING THROUGH RANGE OF *Syrinx aruanus*							
PORT	2/7/94	3/7/94	4/7/94	5/7/94	6/7/94	7/7/94	8/7/94
Auckland	4	1	2	1	2	5	5
Tauranga		1			2		

No claim is being made that any of these vessels transported the specimen, only that this is a possibility. The above table does not include fishing vessels and privately owned craft. If the specimen was taken illegally, there would probably be no record of the vessel involved.

CONCLUSIONS

It is difficult to draw any firm conclusions from a find so unexpected as this. The five hypotheses may, however, stimulate useful debate.

1) **That *Syrinx aruanus* has recently extended its range to include some of the waters around New Zealand**

This is a tropical species without veliger form. That it should be found so far east of its usual range would be surprising. That it should be found so far south is beyond credibility.

2) **That the range of *Syrinx aruanus* is greater than has been recorded up to now and includes some of the waters around New Zealand**

This hypothesis is unlikely for the same reasons as the first. It would also seem unlikely that such a large and noticeable species could live in the Hauraki Gulf without being recorded until now.

3) **That the specimen was transported by natural means from its normal range to Onetangi**

This seems unlikely for the following reasons:-

a) It would have to come a long way under very rough conditions and one would, therefore, expect it to show considerable signs of wear.

b) It is unlikely that the specimen could have floated on the surface for much of the distance involved.

c) Progress across the ocean floor would bring the specimen into contact with numerous obstacles and one would, therefore, expect a shell of such light build to become severely damaged.

d) The prevailing direction of the ocean currents around New Zealand is anticlockwise. Thus, the most likely route for an object carried across the Tasman Sea by currents alone would be firstly southwards and round the southern extremity of New Zealand and then northwards, before it could finally be deposited in the Hauraki Gulf!

4) **That the specimen was transported accidentally from its normal range to Onetangi, either totally or in part, as a result of human activity**

This could have happened in a number of ways. For example:-

a) It could have been taken on board with ballast and then been discharged in the Hauraki Gulf.

b) It could have become entangled in a fishing net.

c) It could have been taken as a specimen and then been accidentally lost or deliberately discarded.

d) It could have been taken by a trawler and then been lost overboard or deliberately discarded.

It is difficult to choose between any one of these possibilities. However, we may safely assume that some such means of transport is far more likely than the other three hypotheses so far discussed. Two factors increase the likelihood of accidental transportation with human aid. Firstly, this is a commercial species. Secondly, it is a species much sought after by collectors, its size and protection by law giving it considerable prestige value.

5) That the specimen was deliberately placed on the beach at Onetangi

We have the following possibilities:-

a) The specimen was thrown away on the beach.

b) The specimen was lost on the beach.

c) The specimen it was planted as a hoax.

We cannot discount any of these possibilities. However, the following factors, which *suggest* that this was not the case, should be taken into account:-

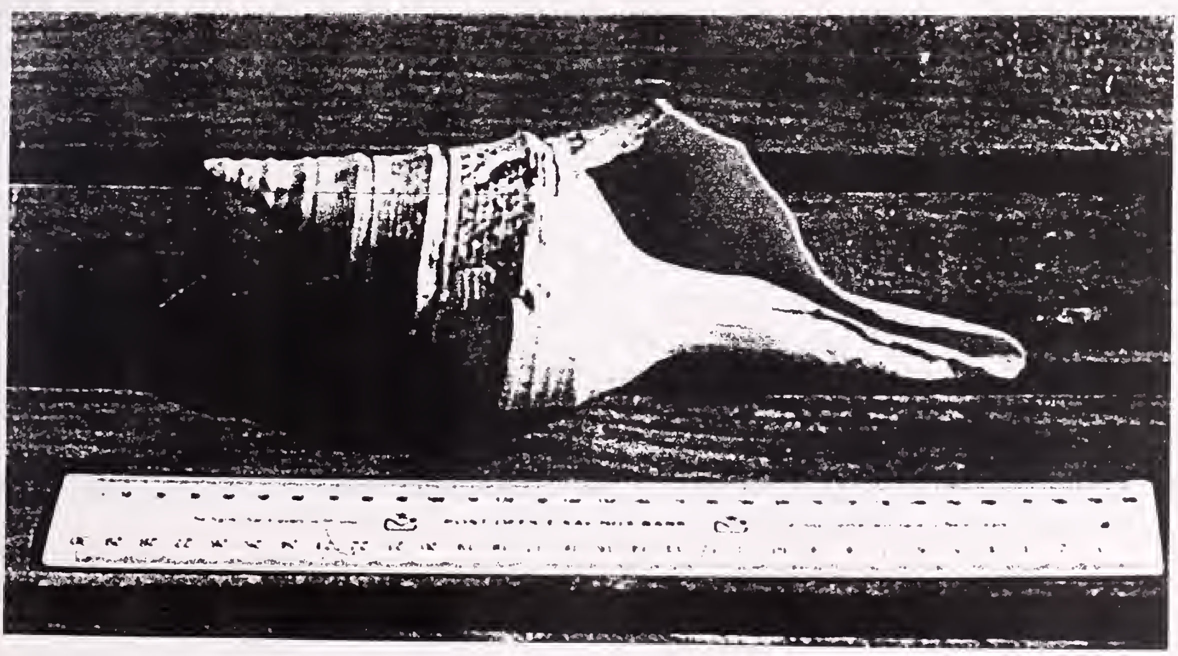
a) The specimen was found on undisturbed sand.

b) It was slightly higher than the drift line.

c) There were run-off marks around it.

These facts would be *consistent* with the specimen's deposition by the receding tide but they do *not* prove that it was not placed there by human hand.

To summarize, then, we can discount completely any possibility of the specimen having been brought to Onetangi by entirely natural means. It would seem that we have to accept that the specimen was transported, at least in part, with human assistance. The present author feels that the most likely turn of events is that the specimen was brought most of the way, either deliberately or unwittingly, as a result of human activity and that the wind and currents carried it on the last leg of its voyage. Nevertheless, we cannot entirely rule out the possibility that human hand brought the specimen to the exact place of its discovery. Much as we would like to see the admittance of such a magnificent species to the marine fauna of New Zealand, we must sadly concede that the discovery of more of its kind on the shores of New Zealand is more likely to indicate transtasman, criminal activity.



TE ARAI BEACH WASHUP

Eagle, Morley & Stace

The Hauraki Gulf beach of Te Arai, normally devoid of washed-up living marine animals, is inundated with such life the first few days after a storm. Such a wash-up, at the beginning of September 1994, was composed mostly of bivalves and gastropods; a low, wide drift, obviously disgorged from nearshore and the innershelf depths of the sea.

Specimens cast ashore by the surf at the climax of the storm lay above the normal high-water mark and had either died from lack of water or suffocated, became the victims of aerial predators such as the common seagull, black-backed gull, and tern. The molluscs deposited within the intertidal zone survived for a short period. Some massed themselves within the sanctuary of tidal rock pools at the south end of the beach. The bivalves and gastropods that were able to bury themselves in the sand survived there during low tide, escaping predation and the drag of a receding tide. However, it was obvious that the returning tide had covered still-buried animals with sand, effectively choking them, as well as surf-churning others. The fresh, empty shells of both bivalves and gastropods wrenched from their shelter and containing dehydrated remains were common.

Pacific immigrants, including four freshly dead *Morula smithi*, four *Hinea brasilanus*, (one live), three abraided *Nassarius pauperus*, four single valves of a yet unidentified *Placamen* sp. were scooped from the very edge of the banked debris. To the best of our knowledge, this is the most southern record for *Morula smithi* and *Hinea brasilanus.* Hidden amongst heavy drifts of *Zethathlia zelandica* were several *Tanea zelandica* and the magical, white beauty of *Polinices melanostroma* (two) and *Polinices flemingiana* (five). Another gift from the ocean were several *Bembicum* sp., a badly broken *Heliacus cf. varigatus*, and a dishevelled, rare *Leptochiton (Parachiton)* sp. indet., found buried in seaweed. These were all unusual southern occurrences for these species. Tiny *Munditia* sp. and a *Rissoina* sp. sheltered in shell sand. An uncommon *Malluvium calcareous* lay with them.

Bivalves, unable to make use of a burying foot, such as juvenile *Atrina pectinata zelandica,* were caught by the waves, and must have continued floating in the water from high tide to low tide, and from low tide back to high tide, knocking against each other so that their shells smashed open. The exposed animals were then bared to inevitable death, either by predation or suffocation on the sand. These dead or dying *Atrina,* which, at the Te Arai washup constituted the bulk of the beach deposits, finally came to rest below high-water mark. Delicate, pure white, *Offadesma angasi,* precipitated by the tide, lay as a pristine offering to the hovering gulls. Overturned *Calliostoma selecta* and the odd *C. tigris* intercalated with the bulk of conjoined, dead valves. Stranded and brown braided, live and hermit crab inhabited *Struthiolaria papulosa* littered the tide line. The putrefaction odour of Neptune's mortuary wafted a great distance.

TE ARAI POINT 2/8/94		1 indicates the species was present		
GASTROPODS	Author	Live	Dead	
Alcithoe arabica	Marwick 1926		1	
Alcithoe arabica depressa			1	
Amalda (Baryspira) australis			1	
Amalda (Baryspira) mucronata			1	
Amphibola crenata			1	
Antisolarium egenum	Gould 1849		1	
Argobuccinum tumidum			1	
Astrea heliotropium		1		
Austrofusus glans	Roding 1798		1	
Bembicum sp. indet.			1	
Cabestana spengleri		1		
Calliotoma selecta		1		
Cellana radians			1	
Charonia rubicunda		1		
Cominella adspersa		1		
Cominella glandiformis			1	
Cominella maculosa			1	
Duplicaria (Pervicacia) tristis	Deshayes 1859		1	
Epitonium (Hyaloscala) jukesianum	(Fosbes 1852)		1	
Glaphrina caudata			1	
Haliotis australis			1	
Haliotis virginea crispata			1	
Haustrum haustorium			1	
Heliacus cf. varigatus			1	
Hinea brasiliana	(Lamark) 1822		1	
Lepsiella scobina			1	
Malluvium calcareus	Suter 1909		1	
Marginella cairoma			1	
Marginella pygmaea			1	
Micrelenchus tenebrosus	A.Adams 1851	1		
Morula smithi		1		
Nassarius pauperus	(Gould 1850)		1	
Pelicaria vermis flemingi		1		
Penion dilatatus			1	
Penion sulcatus			1	
Polinices flemingiana	(Recluz 1844)		1	
Polinices melanostomoides	Gmelin 1791		1	
Ranella australasia		1		
Ranella parthenopeus		1		
Scutus breviculus			1	
Semicassis labiatum		1		
Semicassis pyrum pyrum		1		
Struthiolaria papulosa	Martyn 1784	1		
Tanea zelandica	Quoy & Gaim 1832		1	
Thais orbita			1	
Tonna cerevisina			1	
Trochus tiaratus			1	
Turbo smaragdus	Gmelin 1871	1	1	
Xymene ambiguus	Philippi 1844		1	
Zaclys sarissa			1	

Zeacumantus subcarinatus		1		
Zethalia zelandica			1	
BIVALVES				
Anomia trigonopsis			1	
Atrina zelandica		1	1	
Austrovenus stutchburyi			1	
Bassina yatei			1	
Chlamys zelandiae			1	
Divaricella (Divalucina) huttoniana			1	
Dosinia anus	Phillipi 1849		1	
Dosinia lambata			1	
Dosinia subrosea	Gray 1835		1	
Gari lineolata			1	
Gari stangeri			1	
Glycymeris modesta			1	
Mactra discors			1	
Modiolarca impacta			1	
Modiolus aerolatus			1	
Offadesma angasi			1	
Panopea zelandica			1	
Paphies australis			1	
Paphies subtrianglatum			1	
Paphies ventricosa			1	
Pecten novaezelandiae			1	
Perna canaliculus			1	
Purpurocardia purpurata			1	
Ruditapes (Paphirus) largillierti			1	
Spisula aequilateralis			1	
Tawera spissa		1		
Tellina liliana		1		
Tucetona laticostata			1	
CHITONS				
Cryptoconchus porosus			1	
Eudoxochiton nobilis			1	
Leptochiton (Parachiton) sp. indet.			1	

TE ARAI 26-7-94 by Sue Donim

Washups have a way with people. They are like sirens, calling from the wave torn beaches and secluded coves. The perfume of decomposing flotsum dumped upon the beach wafts across the nostrils flaring to follow as though of anticipation they had drunk and Lethe-wards had flown. Their four wheel drive discharges the intrepid scavengers of Te Arai Point, clutching catch bags, like bloodhounds leaning into the wind and hot upon the scent!

Trudging knee deep in juvenile *Atrina,* sizing shape, discerning sculpture, searching for the elusive rarity. Eagle eyed the wooly crested vultures vie for strategic stretches of sublittoral littered sand. Pausing to poke, probe and peck. Amphipods scurry.

With wanton destruction the shelly carpet of anticipation is crunched underfoot in the race for the next shining curve; *Xenophalium labiatum*? Is that spire *Columbarium*, *Coluzea* or just *Austrofusus*?

"Can you see it?" "No." "It's mine."

Calliostoma selecta everywhere, few *tigris*.

Fools fossicking, drizzle at their backs, eyes straining, bags filling, averice bred of collecting driving them. Each and every specimen a gem until it fades into the light of common day.

Lunch was eaten, no fungus, no alcohol but shell hash was taken. The *Hinea, Morulla smithi, Nassarius pauperus, Hinea brasiliana, Heliacus,* and *Placamen* spp. were presented on a *Tridachna* by Dial-a-mermaid.

A VISIT TO CLASSIC CASTLECLIFF

Glenn Carter

Castlecliff Beach on the coast west of Wanganui seems to stretch forever, only fading in the spray from the waves. On clear days Mt Taranaki rises over the sea cliffs in the distance. At the southern end of the driftwood covered beach are small dunes covered in grasses behind which are toetoe and raupo swamps. Further up the beach the dunes cease and the cliffs rise up to 46 metres in places. Exposed in these cliffs, fossils can be found.

During the late Pliocene to early Pleistocene (2 million to 0.4 million years ago) the Wanganui area was a large sedimentary basin. Sediments deposited in the east of this basin can be seen today in the land exposures and the coastal cliffs. Due to the glacial and interglacial periods, fluctuations in the sea level of up to 100 metres are known to have occurred. Changing of the water temperatures and depths resulted in a highly diverse and abundant fauna representing a range of environments from inner shelf to intertidal. Fossils can be found in different states of preservation in bands or beds of silt and/or sand of varying thickness from 1 to 15 metres.

It is possible to walk the 8 or so kilometres from Castlecliff to Mowhanau. In this section a good range of fossils can be collected but care must be taken from the point where the dunes end (Lower Castlecliff Shellbed) to the stream at Mowhanau, for the tide washes the cliff face and there are very few places to find a safe shelter if caught by the incoming tide.

We stayed in the area a few days in 1992 and preferred to drive up to Mowhanau and walk across the Kai-iwi Stream bridge. We collected up to the Okehu Stream and walked back towards Castlecliff. It was some of the easiest collecting we have ever done. I will provide a brief account of the separate beds we collected samples from. This area covers the coast from Okehu Stream to the cliff end of Castlecliff Beach, some 10km (covering an age from 1 million to 0.4 million years ago) north to south. A knife is all one needs to collect fossils along this coast. All the beds are of soft sediment. Just place carefully in a bag and when you get home give them a gentle wash and they come up clean.

I have delved into Fleming's work, New Zealand Geological Survey Bulletin 52, The Geology of the Wanganui Subdivision, for most of the descriptions of the beds. Sir Charles Fleming (whose own interest in the area started as a boy following a visit to the area with A. W. B. Powell in the 1930's) carried out a detailed geological study of the area. A copy of this Bulletin is a great help in exploring the area as detailed fauna lists are given even if some of the photos are out of date. For example a photo of the Tainui Shellbed Buttress is given with the sea close by in the foreground, whereas now it is some distance away, separated by dunes as the sea once more retreats.

A few kilometres north of Mowhanau overlaying the Kaimatira Pumice Sand, formed during some of the first eruptions from the Taupo area, is the blue siltstone and mudstone of the Lower Kai-iwi siltstone. This strata forms a bed some 16 or

18 metres thick and is the first to be exposed on the south side of Mowhanau Beach. This bed was deposited in 18 to 34 metres of water a few miles from the nearest beach. *Poirieria zelandica*, *Zenatia acinaces*, *Maoricolpus roseus roseus* and *Proxiuber australe* can be plucked out in good condition.

The Omapu Shellbed (a grey mudstone some 3.5 metres thick) contains fossils, most of which are unworn and with bivalves that have both valves intact. Dominant fossils are *Tellinella eugonia*, *Poirieria zelandica*, *Chlamys radiata*, *Zenatia acinaces*, and *Dosinia greyi*. Like a lot of the Castlecliff fossils *Zenatia acinaces* of the lower Westmere Siltstone still retain their original colour. *Alcithoe swainsoni*, *Dentalium marwicki*, *Chlamys gemmulata*, and *Struthiolaria papulosa* can also be collected. In this bed as in most, the fossils are not evenly scattered throughout the thickness but are found in different layers of each bed. Some layers are barren whilst other layers are full of fossils.

The Lower Westmere Siltstone bed has offshore mollusca at its base with 8 to 12 metres of barren silt and sand above. It is divided from the mainly barren Upper Westmere bed by the Kaikokopu Shell grit (which forms a thin richly fossiliferous, though not well preserved bed). Molluscs can be found from a variety of environments, from rocky to estuarine or beach sands to offshore, some which may have been cast up or derived from older sediments. Some of the many fossils that can be collected include; *Anchomasa similis*(intertidal), *Alcithoe*, *Baryspira*, *Cirsotrema*, *Struthiolaria* (commonly cast up on shore), *Amphidesma* (beach sands) and the dominant species found, *Murinops*, *Paratrophon*, *Barbatia*, *Euthrena* (rocky offshore), *Mactra tristis*, *Austrovenus*, *Zeacumantus*,and *Coministra*, (estuarine or harbour silt).

The Kupe Formation one of the more fossiliferous beds on the coast with a total thickness of some 5 metres, was named because it was believed to be the earliest location of the immigrant pecten genus *Notovola*. Kupe is traditionally the earliest human visitor to New Zealand, hence the species was called *Pecten kupei.* We collected *Alcithoe swainsoni*, *Aeneator*, *Struthiolaria (Pelicaria) fossa*, *Penion ormesi*, *Aulacomya atermaoriana*, *Panopea zelandica* and much more. A complicated series of events accompanied the deposition of this formation.

Fauna that lived off sandy beaches, mud banks of enclosed harbours and open coasts to 27 metres with bottom currents, are present; Fleming 1953 in "New Zealand Geological Bulletin 52", describes the following succession of events in the formation of the Kupe Formation. Inter-tidal erosion, deposition of inter-tidal and subtidal sand, irregular or perhaps repeated submergence to a depth of 9 - 27 metres, emergence to between tide marks, submergence to the mud zone in quiet offshore waters (deposition of silt of unknown thickness) and finally, deposition overlying the mud in a position of accentuated wave action to depths of 10 - 27 metres to form a sandy bottom on which the scallops lived.

The fine blue muddy siltstones and mudstones which make up the Upper Kai-iwi sandstones have scattered molluscan fossils throughout but have only two high concentrations, both are *Ostrea* dominant layers, one, 1 metre from the base, the other 3 metres from the top.

If you are there at low tide (and we hope you are) walking out from the cliff and looking north one can clearly make out the different beds, but from here to Castlecliff the cliffs are covered with toetoe and grasses making it harder to clearly define the contacts between the beds. The only positive means of identification is by certain marker fossils, except at the classic Tainui Buttress location which, because of its stratification, is easily found.

The Seafield Sands are one of the first beds on the south end of the beach where fossils (often abraided) can be collected at all tides. The beds were deposited after the underlying Upper Kai-iwi Siltstone had been uplifted above sea level and wave-planed between tide marks by an advancing sea in a renewed transgression to depths of 3 - 43 metres. Among the molluscan fauna collected were; *Pecten marwicki*, *Ostrea sinuata*, and *Proxiuber australe*.

Looking north from near the Seafield Sand

The Lower Castlecliff Shellbed can be found overlying the Seafield Sands. A 1 metre, thin, muddy sandstone, packed with well preserved fossils constitutes this bed. *Purpurocardia purpurata* and *Pecten marwicki* are two of the more common fossils found, along with *Astraea heliotropium*, *Xymene plebeius* and *Alcithoe swainsoni*. By climbing up through the grass and toetoe to an outcroping bed some 9 - 12 metres thick, you will recognise it as the Pinnacle Sands because of the abundance of the small gastropod *Antisolarium*.

We made a large collection of fossils from the sand, as a large slip had cleared an area of grass and rain had washed off the silt, so we just walked along

picking up good specimens of *Xymene ambiguus*, *Columbarium spiralis*, *Alcithoe transformis*, *Pecten marwicki*, *Proxiuber australe*, *Alcithoe fusus*, *Poirieria zelandica*, *Chlamys gemmulata*, *Pterotyphis zealandicus*, *Struthiolaria papulosa*, *Muricopsis octogonus* and many more. These sands were deposited in offshore conditions by a transgressing sea, culminating in a variety of depressions and silt depositions.

The Pinnacle Sand name comes from a place along the coast where a gully was flanked on either side by a pinnacle weathered out of a fossiliferous siltstone, long known to NZGS paleontologists as the Pinnacles, though the northern one has long since weathered down.

The Tainui Shellbed was named after the fossil *Pecten tainui* which is characteristic of this shellbed. The bed is easy to locate as an exposure can be found jutting out from the base of the cliff and is not covered in grass.

The bed consists of fine grey mudstone some 6 metres in thickness containing abundant fossils. *Pelicaria vermis vermis*, *Tugali pliocenica*, *Proxiuber australe*, *Xymene ambiguus*, *Astraea bicarinata*, *Pleuromeris hectori*, and *Chlamys gemmulata* are just a few of the 150 or so different fossils that can be collected there.

The Shakespeare Cliff Siltstone some 9 - 15 metres thick contains scattered fossils with the gastropod *Stiracolpus* being the most abundant. These beds are a typical of mudstone sediment with scattered fossils preserved *in situ.* They were deposited in shallow water after an abrupt change from the quiet offshore conditions during the period the underlying Tainui Shellbed was laid down.

The sequence of events accompanying the deposition of the formation included uplift of the sea floor. The mudstone rose, to be scoured away 3 to 18 metres below sea level. Accumulation of sands and river derived gravels were deposited on a prograding coast. Local tidal estuaries were then formed, presumably by the growth of bay bars.

The Upper Castlecliff Shellbed closely resembles the lithology and fauna of the Lower Castlecliff Shellbed with *Pecten marwicki* locally abundant and preserved with both valves intact.

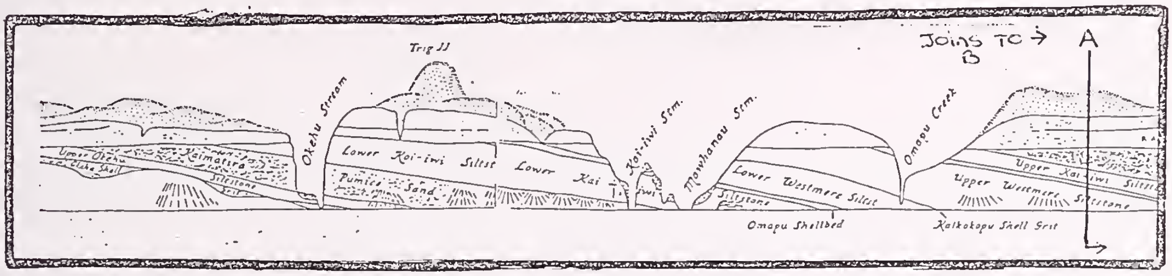
The Karaka Siltstone, conformably overlies the Upper Castlecliff Shellbed and contains scattered fossils derived from mudstone deposited in conditions that did not favour prolific molluscan life.

Mosstown sand, which conformably overlies the Karaka Siltstone, contains rare (hard to find) fossils in poor condition.

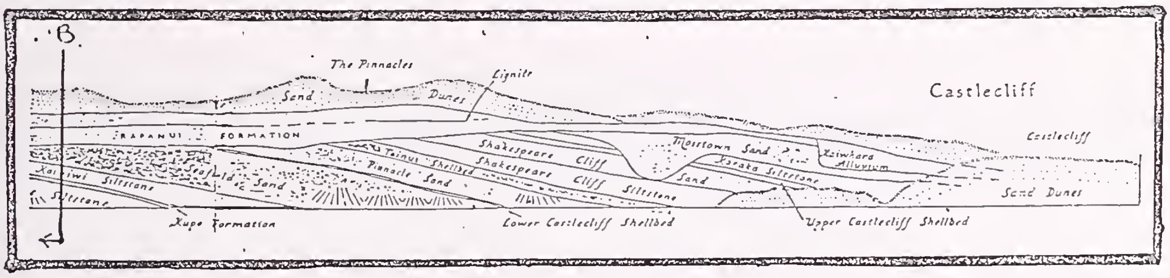
To collect fossils from Castlecliff drive to the north end of Karaka Street which is as far as you can go at Castlecliff then follow the track along the top of the dunes. It takes about 15 or so minutes to get to the first easily accessible site near the Tainui Shellbed.

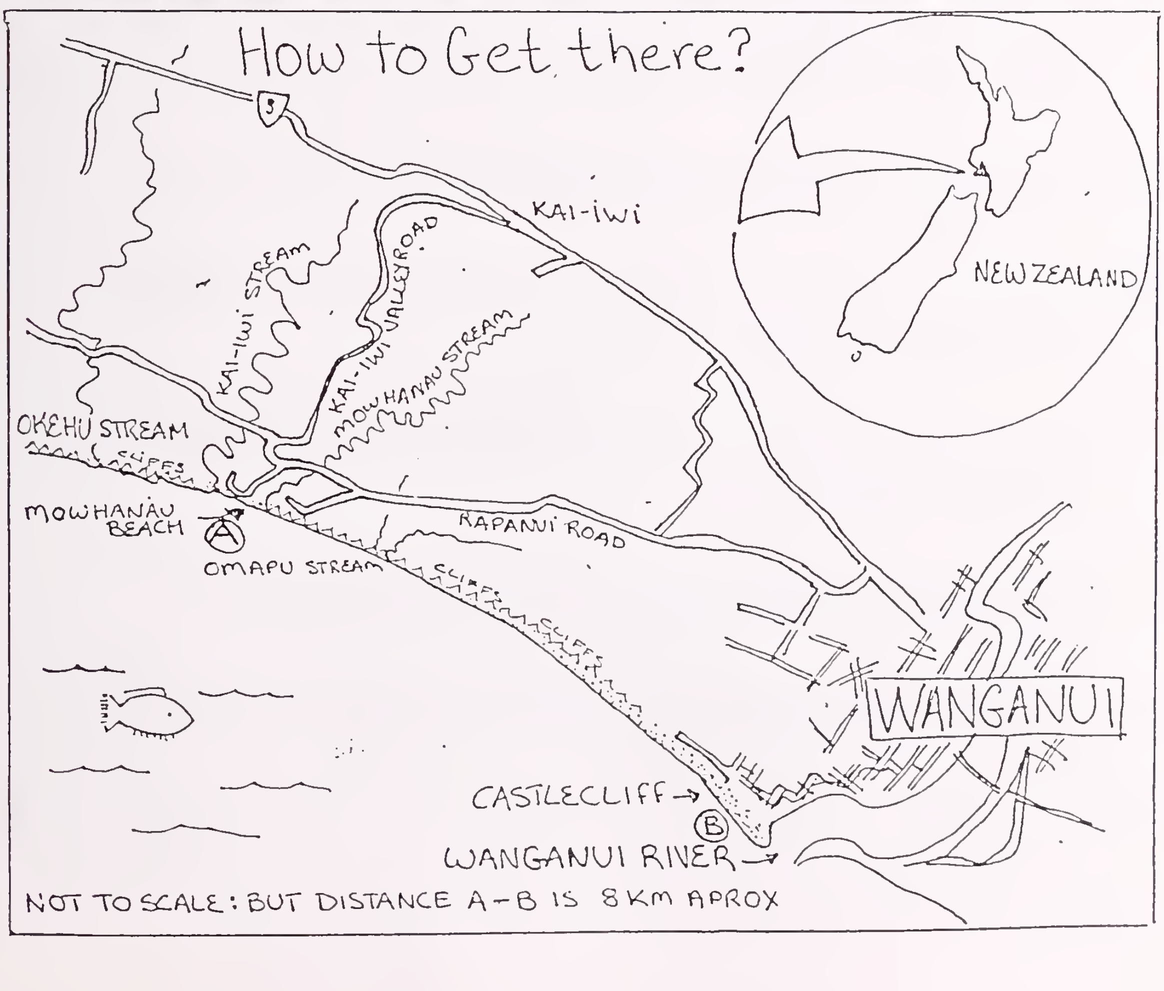
If you do not have much time it is worth driving to Mowhanau and checking the cliff section at the southern end. You can be guaranteed of collecting at least a few nice 900,000 year old fossils without having to walk far.

Further reading:
The Geology of the Wanganui Subdivision, C. A. Fleming
New Zealand Geological Survey Bulletin n.s. 52



·COASTAL SECTION OKEHU STREAM to CASTLECLIFF
From NZGS Bull52:The Geology of Wanganui Subdivision C.A.FLEMING





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Bruce A. Marshall Museum of New Zealand, Wellington.

Copies of all these publications are available in YOUR club library.

1990. *Micropilina tangaroa*, a new monoplacophoran (Mollusca) from northern New Zealand. *The Nautilus* 104(3): 105-107.

1991. Mollusca Gastropoda: Seguenziidae from New Caledonia and the Loyalty Islands. *Memoires de la Museum National d'Histoire Naturelle*, (A) 150: 41-109.

1991. Dates of publication and supraspecific taxa of Bellardi and Sacco's (1873-1904) "I molluschi dei terreni terziarii del Piemonte e della Liguria", and Sacco's (1890) "Catalogo paleontologico del bacino terziario del Piemonte". *The Nautilus* 105(3): 105-115.

1992. Comments on the proposed confirmation of unavailability of the name *Fusus* Helbling, 1779 (Mollusca, Gastropoda) (2). *Bulletin of Zoological Nomenclature* 49(1) 68-70 (with A.G. Beu and W.F. Ponder).

1992. A revision of the Recent species of *Eudolium* Dall, 1889 (Gastropoda: Tonnoidea). *The Nautilus* 106(1): 24-38.

1993. A review of the genus *Kaiparathina* Laws, 1941 (Mollusca: Gastropoda: Trochoidea). *The Veliger* 36(2): 185-198.

1993. The systematic position of *Larochea* Finlay, 1927, and introduction of a new genus and two new species (Mollusca: Gastropoda: Scissurellidae). *Journal of Molluscan Studies* 59: 285-294.

1994. Deep-sea gastropods from the New Zealand region associated with Recent whale bone and an Eocene turtle. *The Nautilus* (published, not yet seen).

1994. An unusual triphorid (Mollusca: Gastropoda) from the Moluccas, Indonesia. *Zoologische Mededilingen* 68 (published, not yet seen).

MIMIWHANGATA - APRIL 1994

Glenys Stace

Even the name sounds magical! About an hour north of Whangarei, on the Helena Bay road, this glorious little coastal peninsula could be described as the southernmost end of the Whangaruru Harbour. A group of Museum volunteers accompanied Jim and Gladys Goulstone on their landsnail survey. The late autumn weather was especially kind, allowing snorkelling every day, and high tide line searches between the tides. Okupe Beach, which is south facing was serene most days and was calm enough for snorkelling allowing the rocks to be examined at the eastern end as well as the normally inaccessible rocks just in front of the Lodge. Mimiwhangata beach faces east, and is usually more calm. The south end of the beach provided many treasures, including whole *Offadesma*, a *Tonna* and a live *Charonia rubicunda*. We put it back!

At present Mimiwhangata is a DOC managed Marine and Coastal Park with partial Marine Reserve status. The road is very narrow and winding but seems to be kept in good condition and should not be a deterrent to visitors. The paradise at the end is worth every dusty metre. It was disapointing to discover a cache of fresh undersize paua shells buried in shallow sand between the rocks, and the tail skins of a few very undersized lobsters. Poaching is unfortunately taking place. The resident DOC caretaker keeps a careful eye on visitors and makes sure they are aware of the rules, but he did not expect to have to look in people's chilli bins as they left the beach! This area is ideal for full Marine Reserve status.

The results of Jim and Fred Brook's landsnail survey will I hope be the subject of a future article in "Poirieria" but we decided to publish the species list compiled by Fiona Thompson, Margaret Morley and Glenys Stace as it is extensive and shows the really interesting variation of the marine fauna in the area.

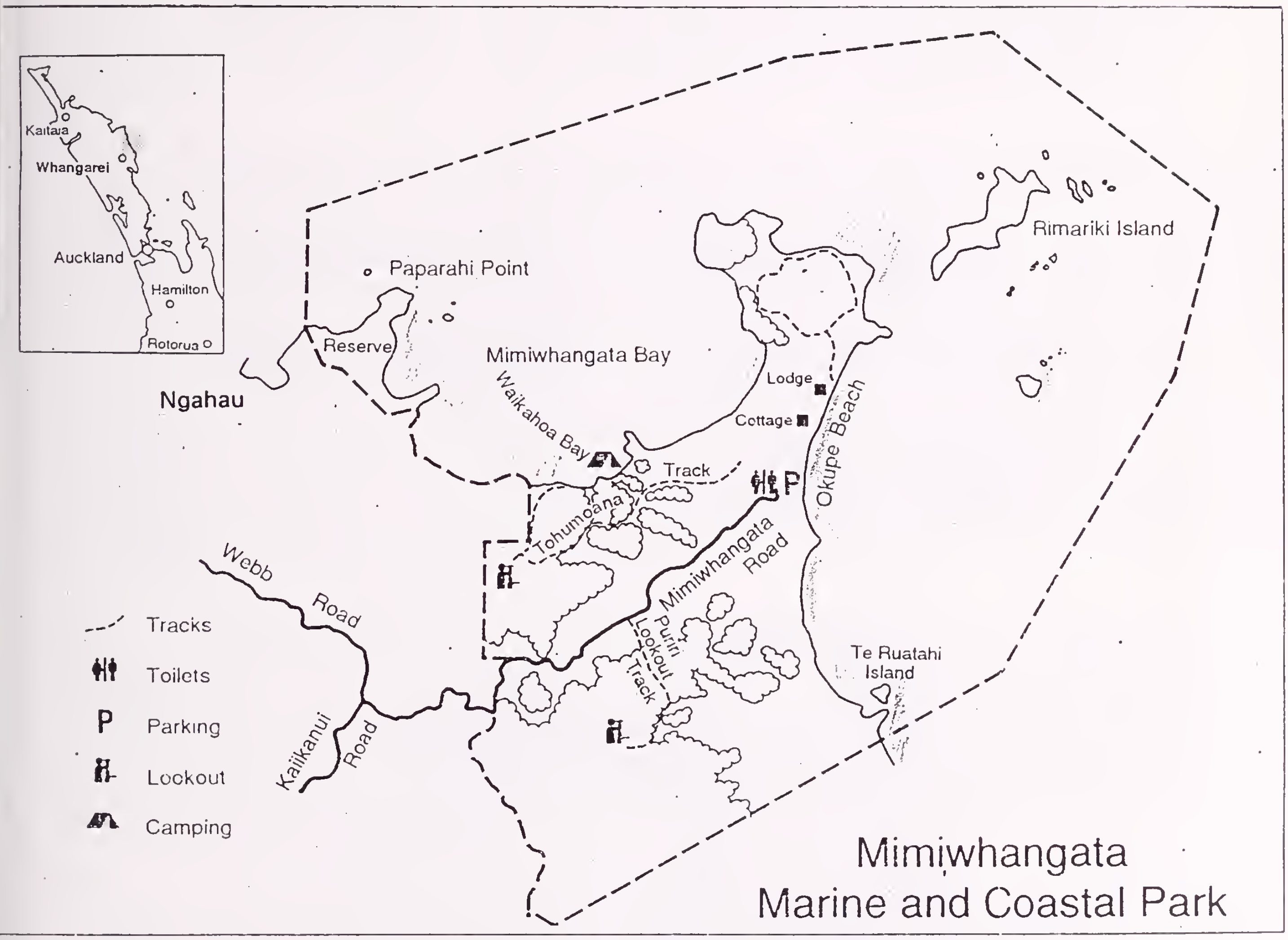
MIMIWHANGATA SPECIES LIST	1 depicts that the species was present.			
GASTROPODS	Mimi	Okupe	Ngahau	Alive
Alcithoe arabica	1	1		
Amalda (Baryspira) australis	1	1		a
Amalda (Gracilispira) novaezelandiae			1	a
Amphibola crenata				
Anabathron excelsus			1	a
Anabathron hedleyi		1		a
Anabathron rugulosus			1	
Antisolarium egenum		1		
Argobuccinium tumidum		1		
Asteracmea suteri	1			
Austrofusus glans		1		
Austromitra rubiginosa		1		a
Austrovenus stutchburyi		1		
Balcis articulata		1		
Buccinulum lineum		1		
Buccinulum vitattum	1	1		
Bulla quoyi		1		
Bullina lineata		1		
Cabestana spengleri	1			a
Calliostoma punctulata		1		a
Calliostoma selecta	1	1		a
Calliostoma tigris	1			a
Cantharidiella tesselata	1	1	1	a
Cantharidus opalus	1	1	1	a
Cantharidus purpurata	1	1		a
Cellana ornata	1	1		

Cellana radians		1		
Cellana stellifera	1	1		
Charonia rubicunda	1	1		a
Cirsostrema zelebori	1	1		
Cominella adspersa		1		a
Cominella maculosa		1		
Cominella quoyana		1		a
Cominella virgata virgata		1		a
Crassitonella carinata		1		
Crepidula costata	1	1		
Cylichna zelandica		1		
Diloma arida		1	1	a
Diloma bicanaliculata		1	1	a
Duplicaria (Pervicacia) tristis		1	1	a
Eatoniella aff. puniceomacer	1	1		
Eatoniella limbata		1		
Eatoniella lutea		1		a
Eatoniella maculosa		1		
Eatoniella olivacea		1		a
Eatoniella roseola	1	1		a
Emarginula striata	1			
Epitonium jukesianum	1	1		a
Fictonoba rufolactea		1		
Glaphrina caudata	1	1		a
Gumina minor	1	1		a
Haliotis australis			1	a
Haliotis iris			1	
Haliotis virginea crispata	1	1		
Haustrum haustorium				
Helix adspersa		1		a
Lepsiella scobina	1		1	a
Linopyrga rugata		1		
Macrozafra subabnormis		1		
Maoricolpus roseus roseus	1			
Maoricrypta (zeacrypta) monoxyla	1	1	1	a
Marginella pygmaea		1	1	a
Marginella cairoma	1			a
Melagraphia aethiops	1			a
Melanopsis trifasciata	1			a
Merelina taupoensis	1	1		
Merelina lyalliana			1	a
Micrelenchus dilatatus	1	1		a
Micrelenchus sanguineus		1		a
Micrelenchus tenebrosus			1	a
Murexul octogonus	1			
Neoguraleus murdochi				
Neoguraleus sinclairi	1	1		
Nerita atramentosa				
Nodilittorina antipodum unifasciata	1	1		a
Notoacmea daedala		1		
Notoacmea subtilis		1		a
Notoscrobs falsestea		1	1	a
Onchidella nigricans		1	1	a

Pelicaria vermis	1	1		a
Penion sulcatus		1		a
Phenatoma rosea	1	1		a
Phenatoma zelandica		1		
Philine powelli			1	a
Pisinna impressa		1		a
Pisinna rehohuana lactorubra		1	1	a
Pisinna semiplicata		1		
Pisinna zosterophila	1	1		a
Potamopyrgus pupoides		1		
Ranella australsia	1	1		a
Ranella parthenopeus	1	1		
Risellopsis obsoleta		1		
Rissoa hamiltoni	1			
Rissoina achatina	1	1		a
Rissoina chathamensis	1	1		
Sassia parkinsonia			1	
Scutus breviculus	1	1		a
Seila sp.		1		a
Sigapatella novaezelandiae	1	1		a
Siphonaria australis	1	1		a
Struthiolaria papulosa	1	1		a
Succinea archeyi		1		
Tanea zelandica	1		1	a
Taron dubius	1			a
Thais orbita	1			
Tonna cerevisina	1	1		a
Trichosirius inornatus		1		
Triphora sp.			1	
Trivia merces		1		
Trochus viridus			1	
Tugali elegans		1		a
Turbo granosus		1		a
Turbo smaragdus		1		a
Turbonilla sp.	1	1		a
Xenophalium labiatum	1	1		
Xenophalium pyrum pyrum	1	1		a
Xymene ambiguus		1		
Xymene traversi	1	1		a
Zaclys sarissa	1	1		
Zeacolpus (Stiracolpus) blacki	1	1		a
Zeacolpus pagoda	1	1		a
Zeacumantus subcarinatus	1	1		a
Zegalerus tenuis	1	1		a
Zemitrella sp.	1			a
Zerotula ammonitoides		1		
Zethalia zelandica		1	1	

MI MIWHANGATA SPECIES LIST				
BIVALVES	Mimi	Okupe	Ngahau	Alive
Anomia trigonopsis	1	1		
Atrina zelandica	1	1		
Austrovenus stuchburyi	1			
Barbatia novaezelandiae		1		
Bassina yatei	1			
Borniola reniformis		1		
Cardita brookesi		1		
Chlamys zelandiae	1	1		
Corbula (Anisocorbula)zelandica				
Crassostrea glomerata	1	1		a
Diplodonta globosa	1			
Divaricella (Divalucina) huttoniana	1	1		
Dosinia (Austrodosinia) anus		1		
Dosinia (Phacosoma) subrosea				
Dosinia maoriana		1		
Dosinula zelandica		1		
Felaniella zelandica		1		
Gari lineolata	1	1		
Gari stangeri	1	1		
Glycermeris modesta	1	1		
Glycymeris laticostata	1	1		
Gregariella barbata			1	
Hiatella arctica	1	1		a
Limatula maoria		1		
Lithophagia truncata		1		
Longimactra elongata	1	1		
Mactra discors	1	1		
Mactra murchisoni		1		
Mactra ovata	1			
Melliteryx parva			1	
Modiolus areolatus	1	1		a
Modiolus impacta	1	1		a
Monia zelandica		1		
Musculista senhousia		1		
Myadora boltoni		1		
Myadora striata	1	1		
Mylitta stowei		1		
Mytillus edulis aoteana		1		
Neolepton antipodum		1	1	a
Notirus reflexus		1		
Nucula hartvigiana			1	
Nucula nitidula			1	
Offadesma angusi	1			
Ostrea lutraria		1		
Panopea zelandica	1			
Paphies subtriangulata	1	1		a
Pecten novaezelandiae	1			
Perna canaliculus		1		
Philobrya munita	1	1	1	a
Protothaca crassicosta	1	1		
Purpuracardia purpurata		1		

Resania lanceolata	1			
Ruditapes (Paphirus) largillierti	1	1		
Scalpomactra scalpellum	1			
Solemya parkinsoni	1			
Soletellina nitida	1			
Spisula (Crassula) aequilateralis		1		
Tawera spissa	1	1		a
Tellina (Tellinella) huttoni		1		
Tellina gaimardi		1		
Tellina liliana	1	1		
Tiostrea chilensis lutraria	1			
Xenostrobus pulex	1	1		a
Zeacopagia disculus	1	1	1	
Zenatia acinaces	1			



Accommodation

There is accommodation available at Mimiwhangata but this usually needs to be booked well in advance through the Department of Conservation office in Russell.

Mimiwhangata Lodge offers luxury accommodation for up to 8 people. The summer rate is $15 per adult per night and $7.50 per school child, dropping to $12 and $6 in winter. There is a minimum charge of $550 or $450 (winter) per week.

Mimiwhangata Cottage sleeps 8 people in comfort. The summer rate is $10 per adult and $5 per child, dropping to $8 and $4 in winter. The minimum weekly charge is $350 or $250 (winter).

The lodge and cottage are available on a weekly basis from 2 pm Saturday until 10 am the following Saturday.

Both are close to Okupe Beach.

Camping

Camping is being trialled at Waikahoa Bay near Mimiwhangata over the 1993-94 summer.

There is no vehicle access to the campsite and all gear is to be carried in.

Facilities are basic (water and toilet). No open fires are permitted and there is a maximum stay of seven days.

Fees are $3 per adult per night and $1.50 for children.

All commercial fishing is prohibited.

Nets and long lines are not permitted, including those set by contiki and kites.

Amateur fishers may use only the following methods: unweighted, single hooked lines, trolling, spearing and hand-picking.

Only those species of fish and shellfish listed opposite may be taken.

Potting for rock lobsters is permitted providing that only one pot per person, or party, or boat is used.

For permitted species normal regulations apply regarding daily bag limits, sizes, closed seasons, condition, shelling and pot escape gaps.

All other species of finfish and shellfish (including paua and rock oysters) are totally protected.

Permitted Species List

Fin fish		Shellfish
barracouta	kingfish	common kina
billfish (all types)	mackerel (all types)	green lipped mussel
blue maomao	piper (garfish)	rock lobster
flounder (all types)	shark (all types)	scallops
grey mullet	snapper	tuatua
yellow eyed mullet	sole	
gurnard	trevally	
kahawai	tuna (all types)	

AN OYSTER LOVER'S DELIGHT

G. Carter

If you have time to spare on a trip to Wanganui or are just passing through with a few hours to spare, a trip up the Wanganui River to the Oyster Bluff is a recommended detour. The road was opened for vehicular traffic in 1934 after 30 years of construction which was hindered by repeated floods and slips, a reflection of the rugged country through which the road has been built.

Today the road functions as a link for the 400 or so people living in the lower river settlements as well as a popular tourist route and is sealed for over half its 79km length. To view the Oyster Bluffs you only need to travel 28km from Wanganui.

Turn left off State Highway 4 about 14km from the city. At the turn off, a small building contains information and photographs about the river road and history of the area. The road winds up to the summit of Aramoana providing views of the lower end of the river valley and on a clear day Ruapehu can be seen in the distance. The road then winds down again to the wide river flats of Parikino. Some 4km further along you come to Oyster Bluff.

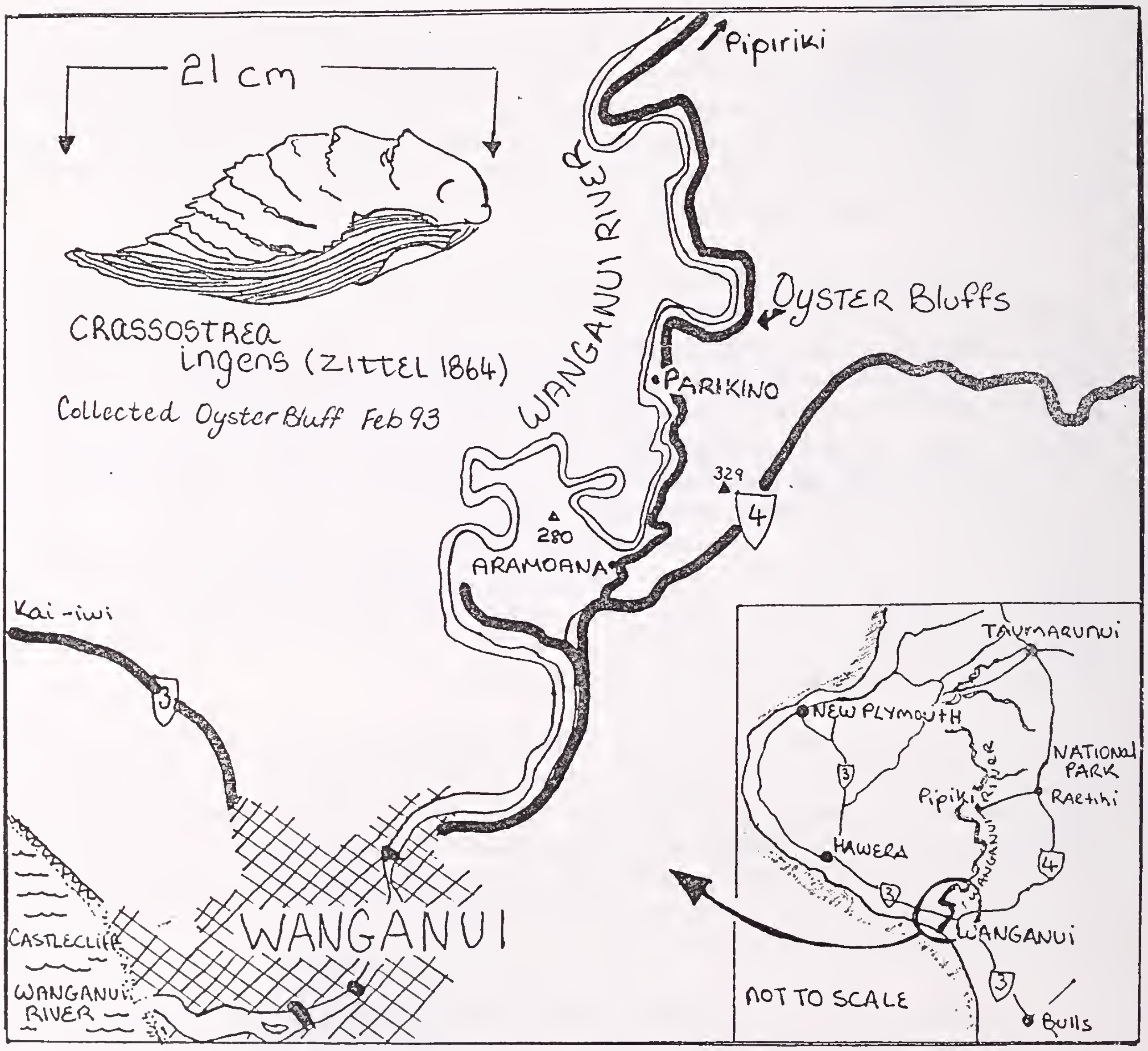
The Oyster Bluff is composed of *Crassostrea ingens* (**Zittel**, 1864) which are exceedingly large(200mm to more than 300mm) and heavy, and are cemented to hard substrates by the umbonal area of left valve. Some specimens are oval (length up to 0.7 of height), but most are narrowly elongate (**Beu, Maxwell & Brazier**, 1990). This is the only giant oyster from the late Miocene-Pliocene rocks of New Zealand. In the late Pliocene about 2,600,000 years ago the current action at depths of 9 to 45 metres, possibly near the entrances to semi-enclosed basins, in channels between islands or at certain depths on the continental slope, caused a bypassing of sediment, resulting in a concentration of molluscan shells. These formed a coarse base which in turn supported the beds of *Crassostrea* (**Fleming**, 1953). The bed or "reef" of *Crassostrea* contains few other fossils although there are other shellbeds above and underlying them, containing generally abundant *Chlamys gemmulata* and *Purpurocardia purpurata*.

Geologists have traced this "reef" which is up to 8 metres thick continuously over more than 45km. (That's some distance.) At the Wanganui Road section you are at a wonderful outcrop with both a weathered and non-weathered exposure. It is not unlike the type exposure which is at Wilkies Bluff on the east side of the Waitotara River not far from its mouth. In both places there is a thick exposure, a wall of oysters, one stacked on top of the other which has to be seen to be appreciated.

Because of slips and flooding the bluff sometimes crumbles. The rock falls which are bulldozed to the road edge and over the bank below contain large blocks of the fossils as well as many loose specimens. Scattered around among the oysters are *Chlamys*, *Stiracolpus*, *Venericardia* and many barnacles.

So if you are in Wanganui take a drive up the river road.

Further Reading:
The River Road (A Guide) published by DOC
The Geology of the Wanganui Subdivision, C. A. Fleming
New Zealand Geological Survey Bulletin 52



PERIODICALS:-

The latest Gloria Maris has an article on Chitons in Bahrain and information with lots of photos on the **Fourth International Shellshow in Belgium**.

The most recent Basteria from Holland has articles on land snails and slugs, *Solecurtis, Triphora, Philine*, and a new *Epitonium* from the Philippines all with excellent illustrations.

Opalia garciai has been named by R.N.Kilburn of the Natal Museum for Dr. Emilio F.Garcia of U.S.A. who supplied the specimens. These tall thin shells from the Philippines have about 15 whorls and are about 46mm tall by only 11mm wide. They are brownish-white with orange-brown spotting. Although classed as an Opalia the species is not typical and Kilburn recognises that it has characteristics of other genera.

The new Apex in from Belgium has a series of articles on *Olividae* discussing;
1.distribution and colour of Olives in Hansa Bay, P.N.G. withsome colour plates.

2.The distinction between the suture and the "sutural channel" on olive shells. The channel is found to be not related to the suture, which is usually not visible at all. It is the bed of an appendage of the mantle.

3."The pre-Lamarckian names for Oliva species". This is not just for the Taxonomist as old sometimes well known names are authenticated or changed and original descriptions referred to.

There is also an article on *Caecum* with a new one from the Canary Islands.

Among the articles in The Nautilus from America are three papers on introduced molluscs, the zebra mussel infesting the Great Lakes Area, two *Thiaridae* in the rivers of central Venezuela and *Corbiculidae* in Uruguay.

For the *Murex* fans a discussion on the validity of the types named by Frank Collins Baker, better known for his work on land and fresh-water snails.

These articles are in **ENGLISH** and they are available in **YOUR** library.

Apology:

The Editor wishes to apologise to Bev Elliott for changing the date at the end of her article. Bev Elliott wishes to make it known that, as a Christian and a Creationist, she does NOT believe in the millions of years which the Editor added to her Chlamys article in the May '94 Poirieria.

POIRIERIA

Auckland Museum
Conchology Section

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CONTENTS

"Poirieria" welcomes contributions on suitable topics, typed or on disc if possible, but neatly handwritten articles are also welcome. Please send to: The Editor, Glenys Stace, Auckland Institute and Museum, Private Bag 92018, Auckland, New Zealand.

Subscription to **"Poirieria"** is by membership of the Auckland Museum Conchology Section (enquire of the Secretary) or by payment of $20 per calendar year for surface mail and NZ$25 for economy air mail.

Some back numbers of **"Poirieria"** are available.
Please send all changes of address, queries on distribution of **"Poirieria"**, and reciprocal material to: Nancy Smith, 4 Kallista Place, Brown's Bay, Auckland 1310 New Zealand.
All other correspondence should go to: The Secretary, Mrs M. Town, 9 Otakau Rd. Milford, Auckland 9, New Zealand.

The Editor wishes to thank Margaret Morley and Frank Boulton for their untiring efforts in proof reading and typing for this edition

A Recently Discovered Population of the Golden Volute *Provocator mirabilis* (Finlay 1926)

by Bruce F.Hazelwood

A small quantity of these white porcellaneous "Jewels from the deep" have come to light, via Norman Potter and Dave Gibbs. The author is the proud owner of one slightly imperfect specimen (Fig.1a). These shell were trawled by scampi boats at depths ranging between 450metres and 500 metres off the Auckland Islands, New Zealand during 1994. The National Museum of New Zealand has acquired some specimens from scampi boats.

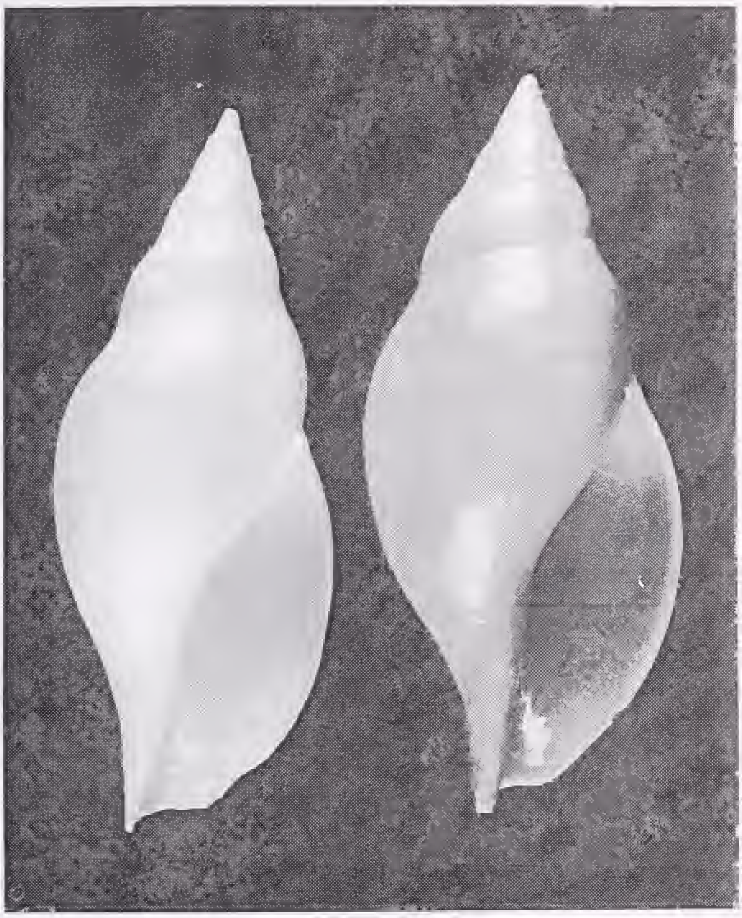


Fig. 1a. *Provocator mirabilis* (white form)   Fig. 1b. *P. mirabilis* (*aurantia* form)

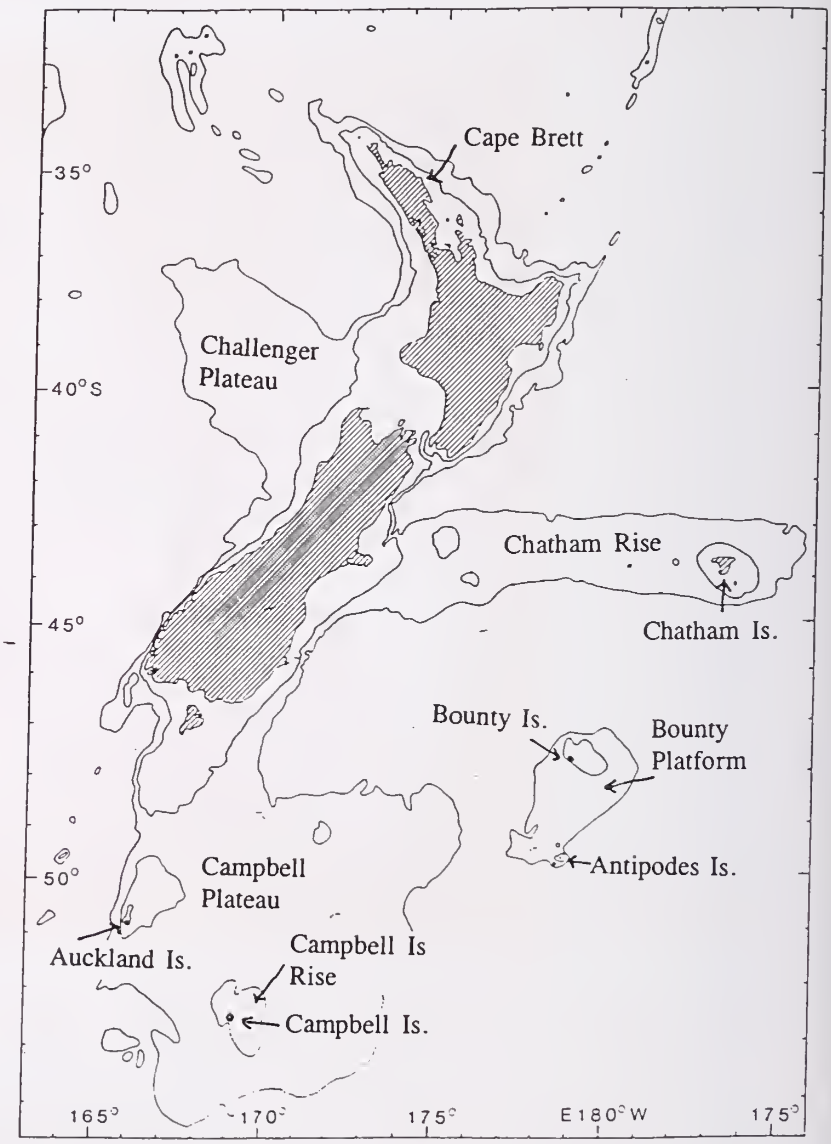
This white form (Fig. 1a) appears to be very localised as the golden\orange colouration is the norm from this area. Although some live taken specimens are in collections, no animals of the white form have been saved for study. Only one exact locality has been recorded for this form: South East of the Auckland Islands, (513 metres depth) 51o 08.8'South, 166o 24.4'East.

The specimen of *P. Mirabilis* (*aurantia* form) (Fig. 1b) was trawled from the Chatham Rise in 390metres. 42o 20' South, 175o 30' East. Its range is from Cape Brett in the North Island to the Campbell Plateau, East Coast.

Taxonomy: <u>*Provocator mirabilis* (Finlay 1926)</u>
= *Iredalina mirabilis* Finlay, 1926
= *Iredalina finlayi* King, 1933
= *Iredalina aurantia* Powell 1954B

References: Beu, A. G. & Maxwell, P. A. Cenozoic Mollusca of New Zealand 1990
Poppe, G. T. & Goto, Y. Volutes 1992
Powell, A. W. B. NZ Mollusca 1979
Weaver, C.F. & DuPont, J.E. The Living Volutes, 1970
Thanks to Bruce Marshall, Museum of New Zealand, Wellington.

Map of New Zealand Showing Relationship of the Chatham Rise and Auckland Islands



Ed. Note: Scampi is the common name of *Nephrops thomsoni*. The genus is worldwide, and the species occurs in Australasian waters. In Australian waters they can be found from 60 - 100m off the New South Wales Coast but in New Zealand waters they tend to be bottom dwelling in soft sandy mud about 250 - 750m. Trial trawls have taken place all around New Zealand and the trials have nearly achieved commercial quantities in the Bay of Plenty. They are trawled with a fine mesh or box trawl. Ideal for bringing up other species such as *Provocator*!

Paphies species from the Kaawa Creek Faunule

by Glenys Stace

"*Amphidesma sp*" A fragmentary left valve, collected by Mr C.A. Fleming, has the hinge and form of *Amphidesma*. The shell appears to be unicarinate posteriorly, but the surface is rubbed and secondary carination, if originally present, may have been obliterated. The dentition does not exactly agree with that of any described Neozelanic species (Fig. 1).
New record. Specimen in Mr Fleming's collection.
(C.R. Laws Kaawa Creek paper 1940, T.R.S.N.Z. 69: 434)

As I searched the literature for references to fossil *Paphies*, the above reference caught my interest. I examined this specimen and compared it to other *Paphies* species, recent and fossil in the collection of Auckland Institute and Museum and a private collection. Where possible I compared it to a juvenile specimen of comparable size. (Illustrations are photocopies of the originals and are as near as possible to life size.) The Kaawa specimen is broken and abraided, making comparison difficult. The result is that, like Laws, I have not been able to locate a species with which we have a definitive match!

Kaawa Creek has been established as an Opoitian, Pliocene, 3 - 5 myo, (Marwick 1948) deposit, slightly older than than the Otahuhu Brewery Well faunule (Laws 1950). At both locations *P. australe* had been found. If Laws had considered this specimen to be *P. australe* it would not have deserved even so cursory a mention. Clearly he considered it to be one of the other *Paphies* species but did not attempt to identify it further.

There are sufficient morohological features, such as the angle of the resilifer, the posterior muscle scar, the angle at the umbones, the width of the anterior dorsal margin, the external growth lines, and the posterior radial ridge, to use for identification. I have taken each *Paphies* species in turn compared these features. This was achieved by choosing an example with comparable comparable size of posterior muscle scar.

P. australe was not likely to be a possibility. The angle and size of the resilifer of *P. australe* are very comparable as is the width of the anterior dorsal margin but the angle at the umbone is wider and on the exterior, the distinct posterior radial ridge of the Kaawa specimen is missing from *P. australe*. (Fig. 2)

P. ventricosa has the resilifer on a similar angle to the Kaawa specimen, the angle at the umbone is more accute and it becomes obvious from the size of the resilifer and width of the anterior dorsal margin that *P. ventricosa* is a thinner, lighter shell. The posterior radial ridge is similar, but the growth lines show more curvature along the ventral margin (Fig. 3).

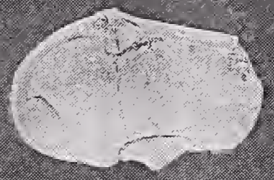


Fig. 1. C. R. Laws Kaawa specimen

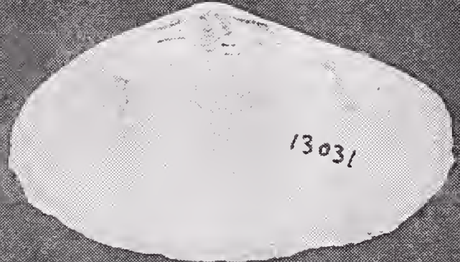


Fig. 2. *Paphies australe*

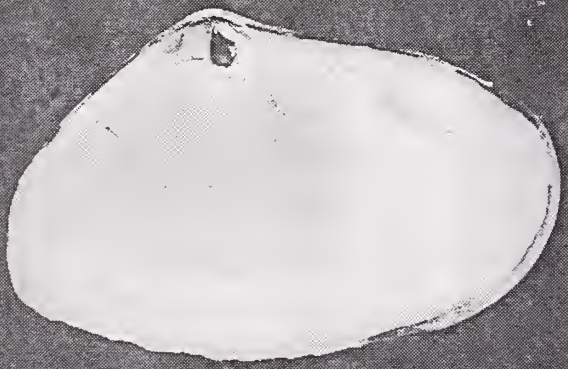


Fig. 3. *Paphies ventricosa*

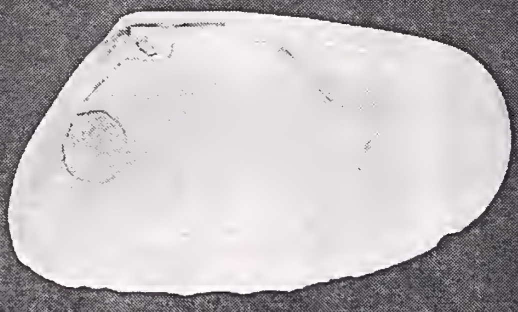


Fig. 4. *Paphies subtriangulata*

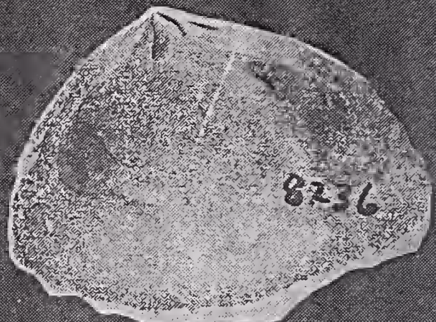


Fig. 5. *Paphies pliocenica*

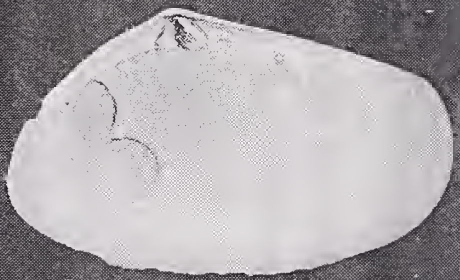


Fig. 6. *Paphies donacina*

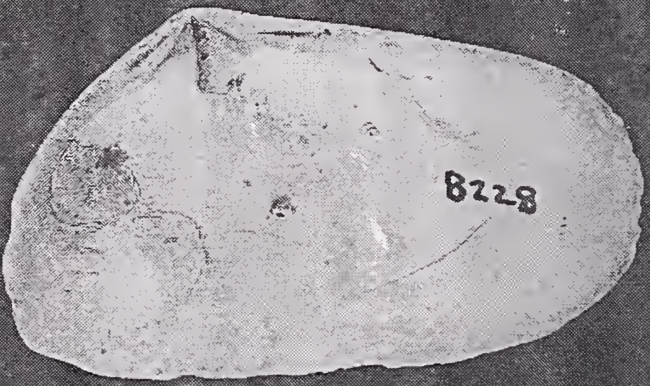


Fig. 7. *Paphies subtriangulata porrecta*

Comparison with *P. subtriangulata* reveals that the spoon shaped resilifer is angled far more towards the anterior than the Kaawa specimen although the general shell shape (or that part that can be reasonably regarded as original) including the angle at the umbone, is similar. The width of the face of the anterior slope is wider. The exterior features appear similar (Fig. 4).

A note enclosed with the specimen in Law's handwriting suggests " The angle of the hinge and angle of cardinal in line towards ant. lateral is suggestive this is a juvenile of a large form such as *pliocenica*, which is known in adult form from this horizon."

Laws suggests that the Kaawa specimen is a juvenile of *P. pliocenica*. Comparison with a *P.pliocenica* of a similar size from Castlecliff shows both similarities and differences. The resilifer is similar, but is angled slightly more towards the posterior in the *P. pliocenica* and the angle at the umbone is more accute. Small specimens of "*P. pliocenica*" from Kai Iwi were also examined, but these differences were even more apparent. The differences were less obvious on the exterior, but they were reflected in the growth lines and the shape of the posterior radial ridge (Fig. 5).

The two species most similar and most likely to prove a positive match are *P. donacina* and *P. porrecta*.

The shape of both these species match very well, but the resilifer of *P. donacina*, like that of *P. subtriangulata* angles very slightly more towards the anterior than the Kaawa specimen and is smaller. The angle at the umbone, the posterior muscle scar and the width of the anterior dorsal margin are a good match. Externally the growth lines and the posterior radial ridge appear identical (Fig. 6).

The angle, size and shape of the resilifer are very similar in *P. subtriangulata porrecta*, as is the angle at the umbone, the posterior muscle scars and the width of the anterior dorsal margin. Externally, the shape, including the posterior ridge also appear identical. Both the recent and the fossil specimens chosen for comparison match very well (Fig. 7). This is undoubtedly the closest match. On comparison, the holotype of *P. s. porrecta* is a much larger shell but the above similarities between all the morphological features used for comparison are definable. Even the illustration of *P. porrecta* Marwick 1928 in Marwick's original paper is a close a match (Fig. 8).

An examination of a series of recent specimens of *P. subtriangulata porrecta* from two collections from the Chatham Islands shows a considerable variation in all the morphological factors that I have used for comparison, so much so that in one case a specimen is almost identical to the *P. pliocenica* used in Fig 5 for comparison.

Recent work, not yet published by Dr Jenny Dugan on the variation in shell morphology of *P. subtriangulata* also indicates a wide variation in this species. (pers. comm.) I have at times had difficulty distinguishing between *P. subtriangulata* and *P. donacina* by shell morphology alone. Although various factors such as the angle of the resilifer appear fairly consistent, the only conclusion I am prepared to draw is that the specimen belongs to that group commonly referred to as "Tuatua". As such it extends the range of the group of *Paphies* known as Tuatua back to the Pliocene, Opoitian, NZ stage.

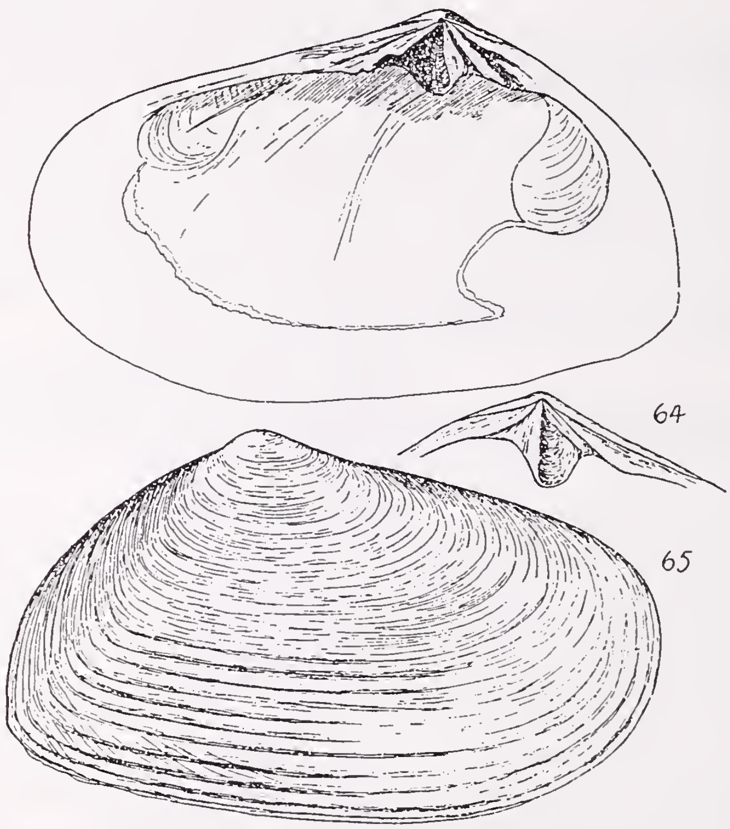


FIG. 64.—*Amphidesma (Taria) porrectum* n. sp., paratype x 0.9, p. 468.

Fig. 8. Illustration of holotype of *P. porrecta* Marwick 1928

LANDSNAILS PAST AND PRESENT AT MIMIWHANGATA

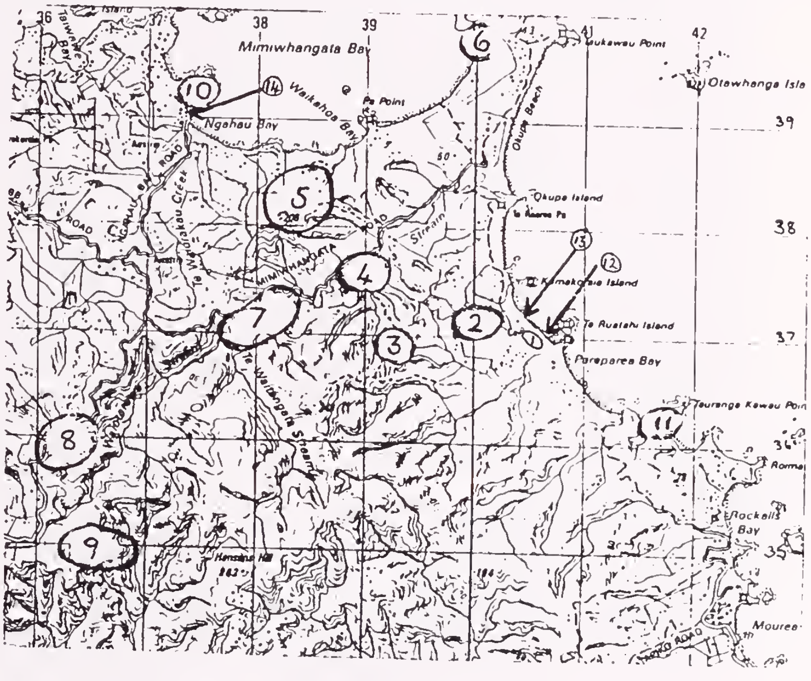
Fred Brook & Jim Goulstone

This is a record of snail collecting largely undertaken by both of us together in December 1993 and April 1994 but F.B did some before and after these dates. In this report individual collecting stations have been joined for simplicity and the larger areas numbered. The map shown is from the N.Z.M.S. 260 series Q06. All the sites are within the Mimiwhangata Coastal Park except Tauranga Kawau Pt. which is slightly to the south and privately owned. The fossil site at Te Ruatahi was mostly collected by F.B during 1993 but J.G also sorted the Auckland University Geology Dept. holdings collected by P.R.Millener in 1978.

The coastal park at Mimiwhangata has 3,194 hectares consisting of :- Farmland 323ha, coastal & forest protected area 843ha, marine conservation area 2000ha, scenic reserve 28ha. The bush has been mostly cleared from the coastal strip but there is a little along cliffs at the north end of Mimiwhangata Beach and the south end of Ngahau Bay. Above Waikahoa Bay there is a protected regenerating area leading right up from the beach to the North Lookout and though its lower reaches have been well grazed it may one day provide a useful continuum from coast to crest. The valley running inland opposite Te Ruatahi Island has some good patches of fenced bush on its lower slopes and this is probably the best example of remaining coastal bush at present.

Coastal bush in the Te Ruatahi valley is predominantly taraire & puriri with many nikau and some totara . Kahikatea in the wetter spots and odd rimu and rewarewa are also noticeable. Behind Waikahoa Bay there is pohutukawa as well and cliffs at North Mimiwhangata had flax, mahoe, kawakawa,ngaio and scrubbier species. A grove of old pohutukawas and puriris left in the paddocks behind the Te Ruatahi Beach were important for the snails living in their epiphytes. Furtherback in the hills rimu became more prominent with tawa in places and much manuka and kanuka. Nikau was prominent everywhere.

Of particular interest was the occurence of substantial deposits of subfossil snails at several places in sand dunes behind the beaches. The major deposit at Te Ruatahi is now covering over but could always be scoured out again by the creek.



List of sites:

Some sites have been amalgamated in this table and the number in parentheses is the number of individual sites c-ombined in each area.

1. (7) Epiphytes in pohutukawa and puriri behind the beach at Te Ruatahi.
2. (12) Bush covering several small ridges and valleys on the southern side of the main valley opposite Te Ruatahi Island.
3.(8) At the head of the Te Ruatahi Valley just below and around the southern lookout.
4.(2) On the banks of the Te Rewa Stream at the point where it divides
5. (5)Around the northern lookout; sites encompassing northern southern and eastern slopes of the hill.
6. (2)The cliffs at the northeastern end of Mimiwhangata Beach where the bush comes right down to the water.
7. (2) Two sites along the Mimiwhangata Road under rimu.
8. (2) Two sites along the Kaikanui Road, again under rimu though these trees were large.

9. (3) An old partly formed road along the southern boundary of the park. There was a variety of vegetation types along the road and we sampled several..
10.(1) At the western end of Ngahau Bayat the start of a track where the cliffs were mostly covered with kohekohe and puriri.
11. (5) Tauranga Kawau Point, mostly in a valley with puriri and nikau.
12. (2) The subfossil deposit near Te Ruatahi Island.
13. (1) The northern end of Te Ruatahi Beach has a lot of sub-fossil snails coming out of a steep bank around rocks and an old pohutukawa tree.
14. (1) Ngahau Bay. A lot of sub-fossils are coming out of an eroded foredune being cut away at high tide at the northern end of the beach.

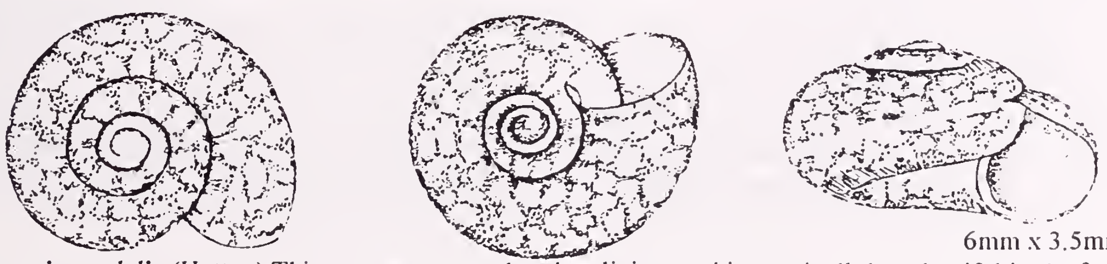
Table of species :
1-9 actual numbers given; 10 - 19 = f (few); 20 - 50 = m(moderate); over 50 = *.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Kokikora miniwhangata Climo & Goulstone		m												
Punctid nsp 73					2									
Punctid cf nsp 73											1			
Punctid nsp 55		m	m	f	f	2	1	4			f			
Punctid nsp 29		5	5		f	3	6	9	2	1	f	*	1	*
Punctid nsp 8			2		2						1			
Punctid nsp 32					1									
Punctid nsp 67		f		8	9		1		1		3	3		1
Punctid nsp 1			1				3							
Kokikora angulata Climo & Goulstone	6									m		*	m	f
Punctid nsp 59							1							
Punctid nsp 24												6	*	
Phrixgnathus conella (Pfeiffer)		*	m	6	m		m	8	8	m	4			
Phrixgnathus cf conella			6					1	6	3				
Phrixgnathus lucidus (Suter)									5					
Phrixgnathus fulguratus (Suter)												*		f
Paralaoma caputspinulae (Reeve)	3	2										*	4	*
Paralaoma lateumbilicata (Suter)		*	m	2	m		7	*			7	m		
Phrixgnathus douglasi Climo & Goulstone			f											
Phrixgnathus cf moellendorffi (Suter)	m	*	f	8	m		9	1		3	m			
Taguahelix crispata Climo & Goulstone		3	2				m	3	4	3	3			
Taguahelix cf crispata										1				
Phrixgnathus powelli Climo		8			2	*					4	*	f	
Obanella rimutaka Dell					1		1							
Phrixgnathus serratocostatus Webster					1									
Charopa coma (Gray)		m	m	2	*		4	2			m	m		
Charopa parva (Suter)	f	1	4				1	1						
Paraharopa fuscosa (Suter)					1		4							
Paracharopa chrysaugeia Webster)		1	1	2	3	1								
Phenacharopa novoseelandica (Pfeiffer)	9	m	f	f	m			2			f	f		1
Charopa transenna (Suter)					1									
Chaureopa titirangiensis (Suter)		2												
Flammocharopa costulata (Hutton)			1				1							
Flammocharopa cf costulata		1			1			1	1					
Cavellia buccinella (Reeve)		*	6		*	5	1			m	2	*	m	*
Cavellia roseveari (Suter)					1	1				1				
Cavellia cf irregularis		f	8	3	7		1	9		2	4			5
Huonodon hectori (Suter)	f	f	f	5	m	*	7	2		m	*	*	f	1
Huonodon pseudoleioda (Suter)		1	8					9						
Mocella eta (Pfeiffer)	f	*		3	m		f	f			m	*	f	m
"Mocella" species 3													6	1
"Mocella" species 4					1					1				

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fectola unidentata (Climo)			1		2	3					1	m		
Fectola mira (Webster)													7	
Therasiella celinde (Gray)		3	5	2	7	1	3	5			3			
Therasiella neozelanica Cumber		5	f		1		3	m	1			f		
Therasiella cf neozelanica		5			2		7		4		2		6	
Therasiella serrata Cumber		f	2	1	5	1	f	3	4		1			1
Therasiella tamora (Hutton)						f							1	
Geminoropa vortex (Hutton)			1											
Flammulina perdita (Hutton)	1	3	6		3		4			2		1		
Allodiscus dimorphus (Pfeiffer)			2											
Thalassohelix ziczag (Gould)		f	m		6				2		6			
Therasia decidua (Pfeiffer)		2				*							1	2
Suteria ide (Gray)			1		5									
Serpho kivi (Gray)		f	f	f	6	3	2		1	1	m	7		
Phenacohelix giveni (Cumber)	f	m	m	m	m	m	4	3		2	m	*		m
Phenacohelix pilula (Reeve)		3		2	9									
Phenacohelix tholoides (Suter)						f	2			m	1	2	f	
Omphalorissa purchasi (Pfeiffer)		1	f	1		f			f		2	*	3	f
*Delos coresia (*Gray)		3	1	3						3		m	1	6
*Delouagapia cordelia (*Hutton)			4		1					4	4	f	1	1
Tornatellinops novoseelandica (Pfeiffer)	*	*	4	3	m	m	3	9		f	f	f	*	f
Tornatellides subperforata (Suter)												7		
Cytora cytora (Gray)			3				4	5						
Cytora pallida (Hutton)		f	3	9	f		5		1					
Cytora torquilla (Suter)				1	2		2		1		1	*	m	*
Liarea hochstetteri (L.Pfeiffer)		1	1											
Liarea turriculata (L.Pfeiffer)		*	*	f	*	8	m	4	5	4	f			
Austrosuccinea archeyi (Powell)												f		f
Suterilla neozelanica (Murdoch)												1		
Otoconcha dimidiata (Pfeiffer)								2						
Cochlicopa lubrica (Muller)											1			
Helix aspersa Muller	1					1								
Oxychilus allarius (Miller)	*										1			
Rhytida dunniae (Gray)												1		
Placostylus hongii (Lesson)											8	*		f

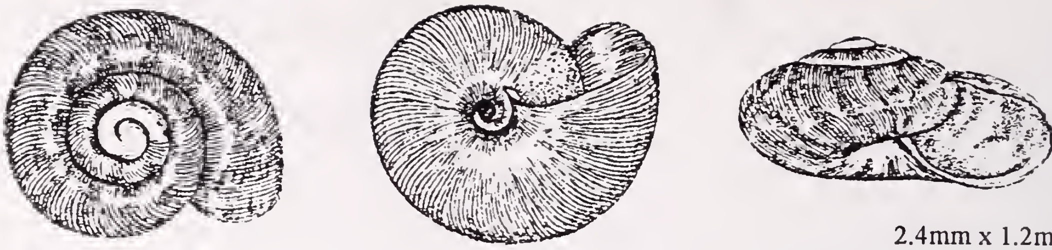
Also living in the dunes above the Te Ruatahi subfossil deposit; *Cochlicella barbara* (Linne), *Austrosuccinea archeyi, Oxychilus allarius, Paralaoma caputspinulae, Tornatellinops novoseelandica, Helix aspersa.*
Living above the Ngahau Bay subfossils; *Paralaoma caputspinulae, Vallonia excentrica* (Sterki).
Te Ruatahi Island although once supporting *Placostylus hongii* is now almost devoid of snails though *Phenacohelix tholoides* appears to be making a comeback. The following shells have also been seen on the Island; *Cochlicella barbara, Tornatellinops novoseelandica,,Phrixgnathus powelli, Helix aspersa*

Illustrations of some species:



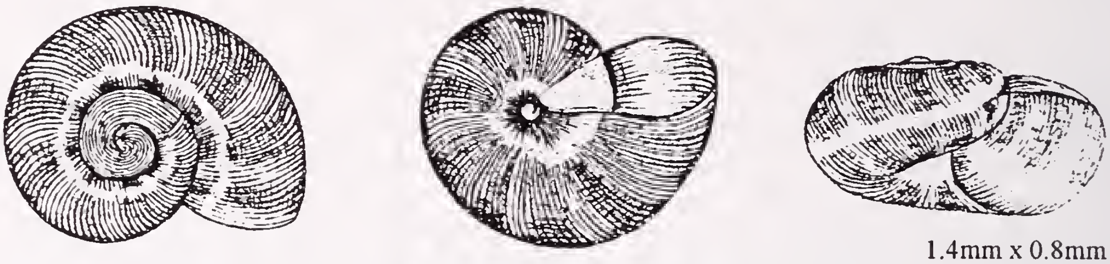
6mm x 3.5mm

Delouagapia cordelia (Hutton) This was never very abundant living, and it wasn't all that plentiful in the fossil deposits where the specimen numbers had probably been accumulated over some time. A comparison with specimens from Te Paki in the far north showed that these ones at Mimiwhangata were generally wider , and flatter with a larger umbilicus.



2.4mm x 1.2mm

Charopa parva (Suter). There were a few of these in the epiphytes as would be expected but they were generally fairly scarce.



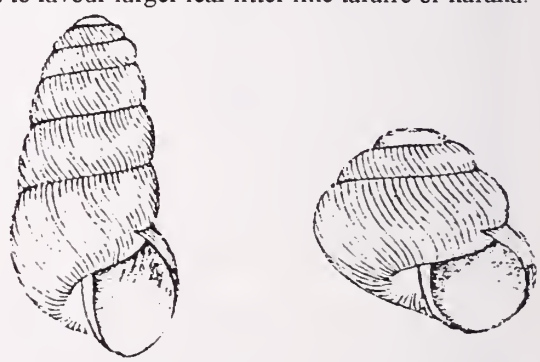
1.4mm x 0.8mm

Flammocharopa cf.costulata This species is widespread though never appears to be abundant. (see Goulstone 1990 p.27 = *F. cf.cosulata c*)

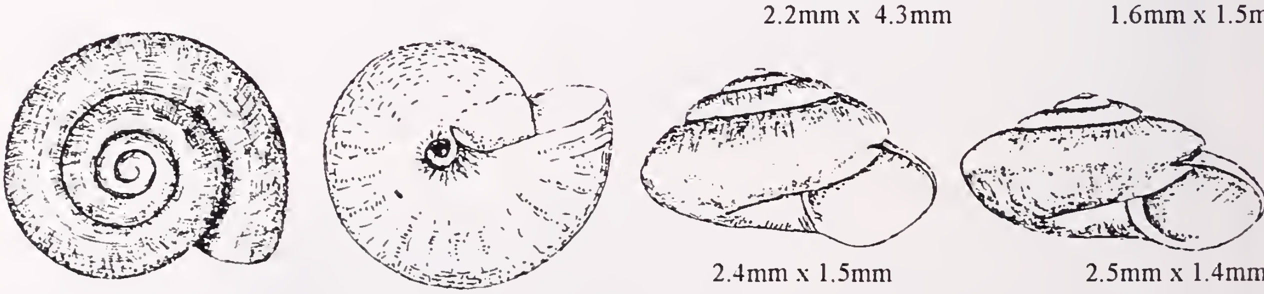
2.4mm x 1.2mm

Cavellia cf.irregularis Not uncommon but takes practice to separate from *C. buccinella.* It seems fairly common all over the north but doesn't get down as far as Auckland. It appears to favour larger leaf litter like taraire or karaka.

Phenacharopa novoseelandica (Pfeiffer). An interesting species with a strange distribution in the north and south of the North Island. It was present in the subfossil, though not abundant, but seems more plentiful today. It was perhaps unexpected to find it living in the epiphytes and it seemed at home in a variety of sites.

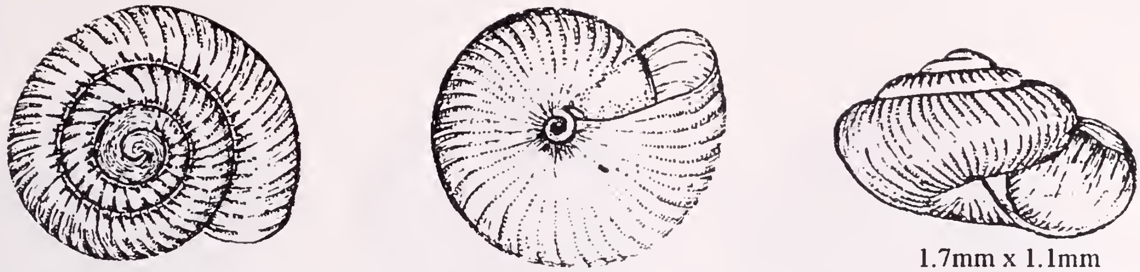


2.2mm x 4.3mm 1.6mm x 1.5mm



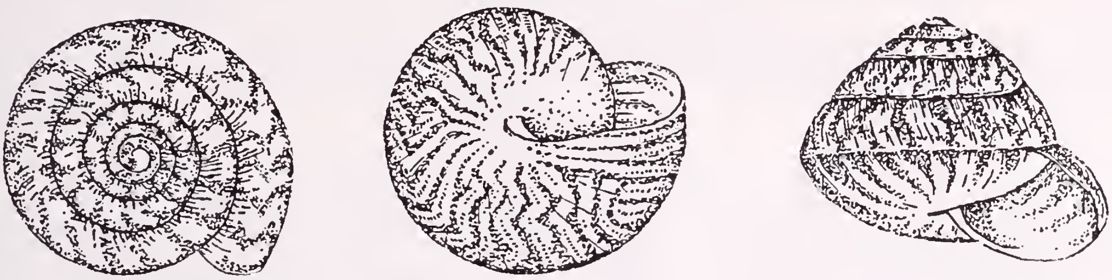
2.4mm x 1.5mm 2.5mm x 1.4mm

Phrixgnathus powelli Climo This is a coastal species of eastern Northland and offshore islands and appears at the northern tip of the Coromandel Peninsula. Our collecting at Mimiwhangata showed it disappearing quickly at inland sites but it was a big feature of the sub-fossil deposits. It was not present in the epiphytes. This is one of the species which typifies this piece of coast as it is the only stretch of mainland coast where it is abundant.

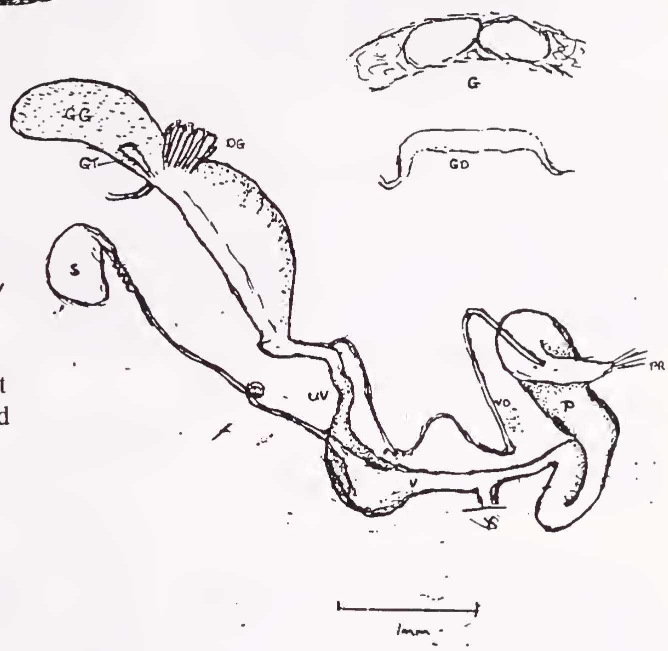


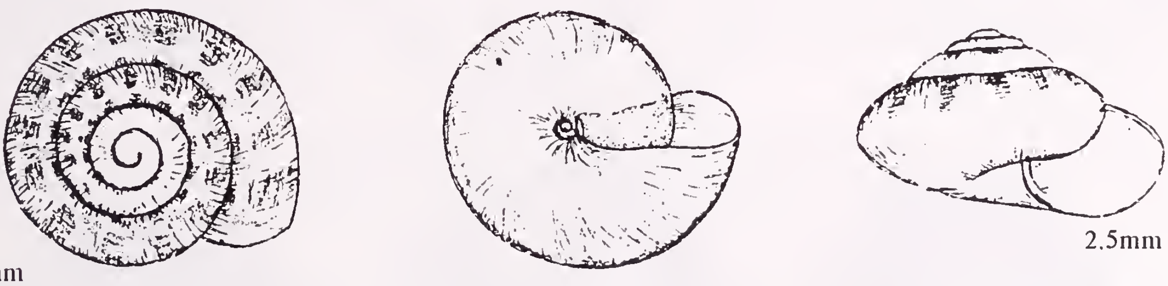
1.7mm x 1.1mm

Taguahelix cf crispata This is a flatter version of *T. crispata* with much more subdued ribbing. We only found one though *T.crispata* itself was very common in places.



Phrixgnathus conella (Pfeiffer) This species at Mimiwhangata is mostly lacking the fine silky ribs which are the hallmark of *conella*. It is a form found along the coast at least from Whananaki to Bay of Islands. It was the prominent larger coloured punctid in all the sites we sampled and was only challenged at coastal sites by *P. cf moellendorffi*. Apart from the lack of ribs it was inclined to be a little larger than *conella* with blocky somewhat brighter colour pattern. Normal *conella* is common around Whangarei so there must be a change just to the north to this form. At Cape Brett there is a similar shell but much larger.This is a field for further study, perhaps including *Phrixgnathus cheesemani* (Suter) which appears to be related but has not been adequately assessed.





2.5mm x

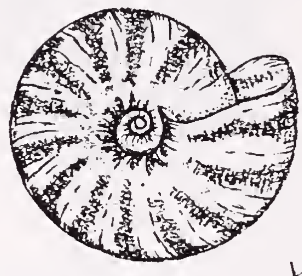
1.5mm

Phrixgnathus fulguratus (Suter) We are not at all sure of the status of this shell which only appeared in the sub-fossil deposits. We have assigned it to this species in the meantime until a more definite match can be found. We would have expected *P. conella* to have been represented in the subfossil deposits but this is the nearest and it is abundant at Te Ruatahi south, though scarce at Ngahau Bay. Some of the specimens at Ngahau Bay might just have come within the dimensions of present *conella* for they were a little taller. We have no data on the dates the various deposits were layed down but have speculatively thought of them in the 200 - 400 year range with the lower layer at Te Ruatahi where most of the *fulguratus* appeared being the oldest.



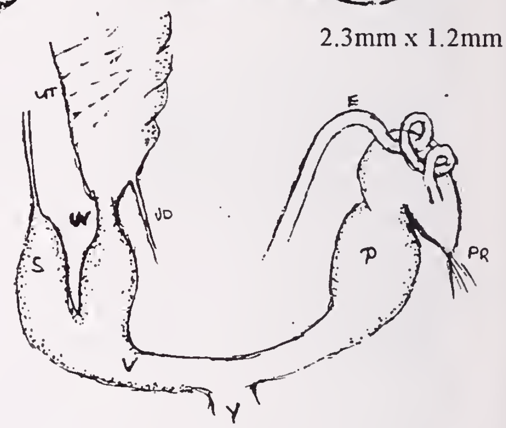
2.4mm x 2.2mm

Phrixgnathus cf conella This is smaller and rounder than *conella* and seems to occur in a band across the middle of Northland. It is a lovely darkish little snail with very fine silky ribs on the shell but it only appeared in ones or twos towards the top of the park.

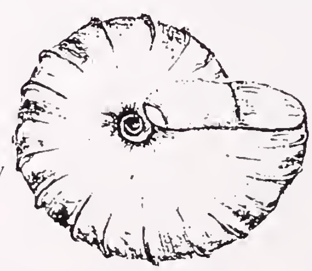
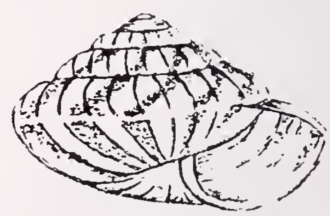



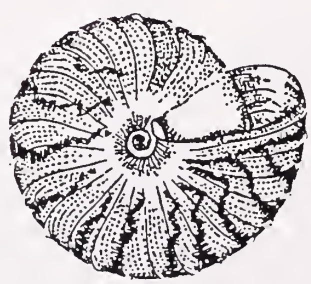
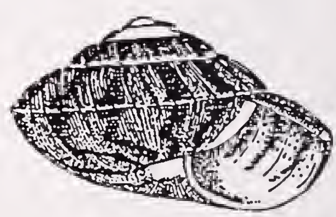

2.3mm x 1.2mm

Phrixgnathus cf moellendorffi A prolific snail near the coast but not so obvious inland. This snail has quite a wide range in the north and does not have the strong spirals of *moellendorffi* to which it is clearly allied. In other parts of the country it has not shown such a strong coastal preference as it has here though *moellendorffi* has always preferred the coast. It does show an arboreal tendency though and was found in the epiphytes. There was no sign of it in any of the subfossil deposits which was surprising.



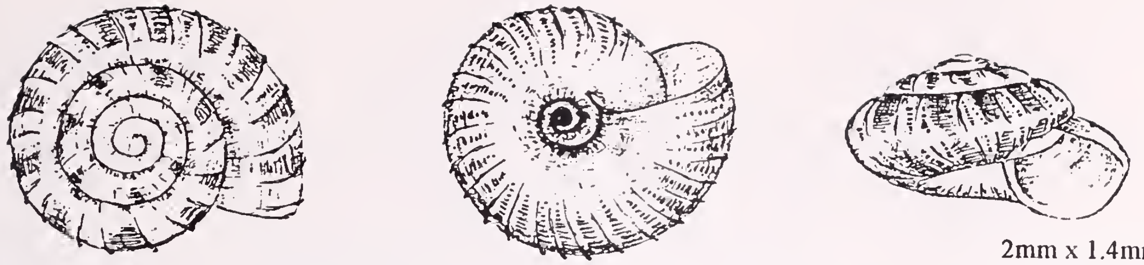
Punctid n.sp. 67 This species is confined to the north of Whangarei more particularly on this east coast. It wasn't particularly plentiful at Mimiwhangata though it occurred at quite a few sites., but it can be quite prolific in other areas.
3mm x 1.8mm

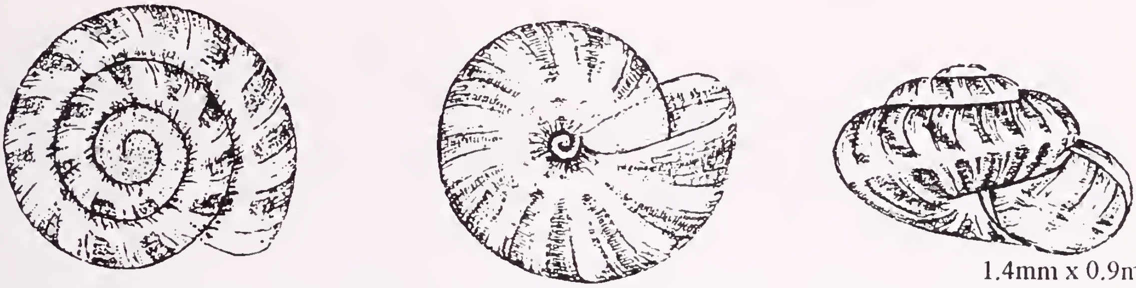
2.5mm x 1.6mm

Punctid n.sp.55 Reasonable numbers of this snail were found, though none in the subfossil or in the epiphytes. It ranges from south of Auckland all over the north but seems to be at its best about Auckland City where it can produce very large numbers in young regenerating bush. Not noted as a coastal species.



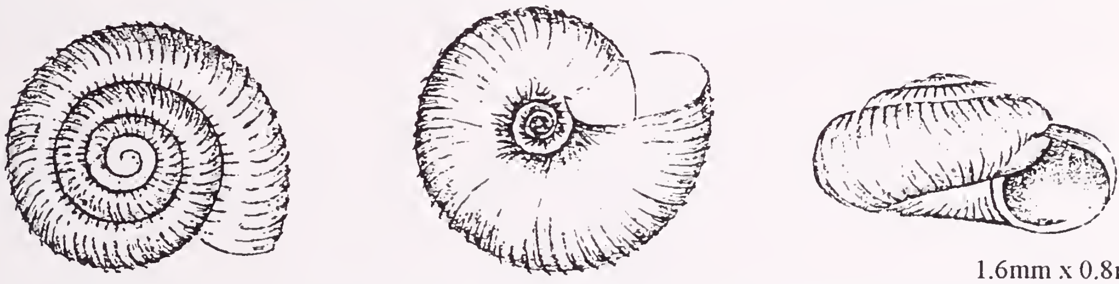
2mm x 1.4mm

Punctid n.sp.73 Only two rather washed out shells were found of this otherwise attractive small species which has bright colour markings and pronounced spiral sculpture. Again this is a species which epitomizes this stretch of Northland coast.



1.4mm x 0.9mm

Punctid cf n.sp.73 One specimen of an unknown snail was found in an epiphyte at Tauranga Kawau Point

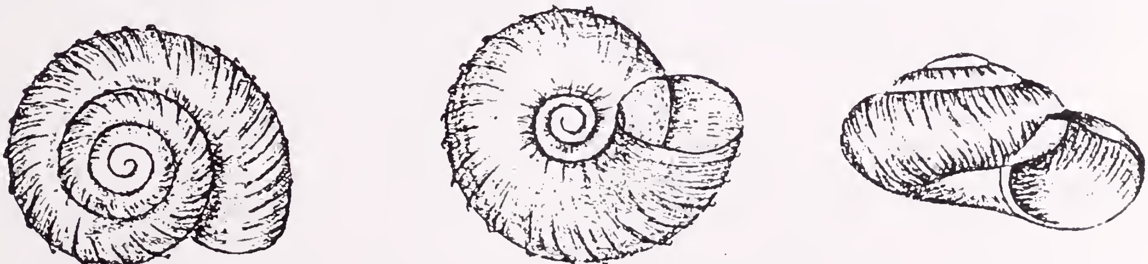


1.6mm x 0.8mm

Paralaoma lateumbilicata (Suter) Common throughout New Zealand and inhabiting many niches it was equally common at Mimiwhangata.

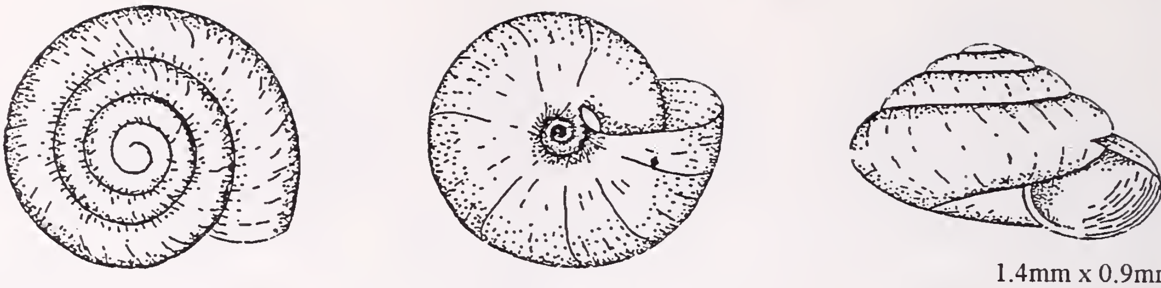
1.8mm x 1.2mm

Punctid n.sp.24 A purely coastal snail found at only one spot both alive and as a subfossil. This would be near the southern edge of its known range and it is not easy to separate from both the foregoing and the following snails which can also live in similar habitats



2.3mm x 1.4mm

Paralaoma caputspinulae (Reeve) A slightly larger species than the last but widespread in New Zealand and prefering a coastal situation where it can be prolific as shown in the sub-fossil deposits.



Kokikora mimiwhangata Climo & Goulstone. A tiny plain species first seen on this survey but subsequently found on the coast as far up as Deep Water Cove and as far south as Whananaki. As far as we know it is purely coastal and seems to mainly live in nikau.

Discussion

This is a very fine park and valuable for preserving snail species with its mix of protected bush from the coast to the hills. Indeed that fenced area on the northern side of the valley above the Te Ruatahi Beach will be crucial for the survival of *Kokikora mimiwhangata* in this area. There is some very nice bush in a similar sort of position in two valleys on the southern side of the ridge, above the farmhouse and leading up to the northern lookout, which is not fenced yet but deserves protection before the animals destroy the understory. There was a large rimu on the edge of the western section which had litter particularly rich in snails but was just beginning to be trampled out by the animals..

Each particular piece of the country has its own peculiar snail fauna which in some ways reflects a larger canvas but also is unique in a small way. The snails are a very true reflection of the history of the land for when it has been completely cleared of original cover it will also have no original snails Selective logging will select snails as well and some will be lost. Climate changes will also change the mix of snails as also will introduced animals and plants. So if we could correctly read the changes in snail populations we could correctly map the history of the land. Of course the same could be said of other fauna and flora but slow moving native snails have been an intrinsic part of the continuing bush for so many million years that they are particularly sensitive to change.

The special value of this Mimiwhangata project has been our ability to monitor earlier snail populations as preserved in several sub-fossil deposits which we could then compare with the living fauna. Because the bush has been cleared from these deposits we had to look for the nearest living snail colonies and that led us into an exploration of epiphytes on some close pohutukawas and puriris that had been left in the paddocks after the clearance. This has certainly altered our perception of New Zealand landsnails which we have traditionally collected from the ground litter, forgetting that many of the dead shells we were collecting could have dropped from the foliage above. Our own perception now is that , at least in the north, a significant number of native snails live above the ground in the foliage, in epiphytes, under bark and in litter collecting in a hundred nooks and crannies on branch and trunk. Not easy to study though as one of us will testify (F.B.) after climbing a long ladder on many occassions balanced on very uneven ground.

One final thought--- although the obstacles are formidable, it would be a jewel in the crown of a presently outstanding park if *Placostylus hongii* could be reintroduced to Te Ruatahi Island from Tauranga Kawau Point where it must be only just hanging on and is obviously threatened. There is some evidence that the Maoris introduced it to Te Ruatahi in the first place so there is a precedence!

References

Goulstone 1990 Landsnails from South Auckland Poirieria 16(2)1-44
Goulstone,Mayhill & Parrish 1993 Tane 34 pp1-32
These two reports will supply illustrations of species not drawn here.

Acknowledgements

The resident ranger at Mimiwhangata, Tim Grant came out with us one day and supplied a ladder and much friendly interest

RETURN TO GREAT BARRIER ISLAND

by Bev Elliott

Great Barrier calls! My hungry heart is yearning
For shady valleys where the tui trills.
Great Barrier calls, and Oh! I am returning
To once-trod foot-trails high in quiet hills.

Grace Medland

1953: Two little girls were walking home from school, along the beach at Tryphena. Recently arrived from Auckland, to live on Great barrier Island, they spotted among the sea-grass on the low tidal sandy mud, several kinds of shells they had never seen before, and their interest was aroused. "Let's see who can find the most!" and eager hands gathered up Brown and White Bubble Shells and Lace Shells. I raced home with my newly-found treasures and displayed them in an empty box. A whole chocolate box full! My very own shell collection!

I don't know whether Julia's interest ever developed into anything bigger, but for me, that was the start of a life-long hobby.

One of my earliest finds, on the sea-grass covered mudflat below our home, was a magnificent live *Semicassis pyrum*; at 80mm and perfect condition, it is still the best one I have in my collection today. I was such a new chum that I still didn't know how to deal with the animal. When it started to smell, I poured Citronella into it, and the smell lingered for some 30 years, but it was preferable to the smell of rotting flesh. I didn't know how to deal with my first *Xenophora* either. I thought it would look better with all those old dead shells taken off it! I still have it, 40 years later, looking rather odd among a box of good specimens, but it does have sentimental value.

My Dad found two big *Charonia capax* for me, 220mm in size. Obviously something more than the original chocolate box would be needed to house my growing collection. And Julia's Dad found her an equally large *Charonia rubicunda*. I hope that lovely shell ended up somewhere better than out in the garden where I saw it!

One day stands out in my memory. I had had an unfortunate encounter with one of Dad's bees, and my leg was swollen from foot to knee. In great distress, and bawling my eyes out, I hobbled down to the beach to try to ease the pain by paddling in the sea. I returned home in a very different frame of mind, delighted with my first *Pupa kirki*, a species which turned out to be reasonably common there.

My first experience of shells in fish gut was disappointing. Dad caught a snapper which had dined on *Notocallista multistriata*. But unlike the obliging blue cod which swallow shells whole, the snapper had chewed its meal very well, and my first *Notocallista*s were like incomplete jigsaw puzzles, fortunately to be replaced by whole ones at a later date.

Tryphena shell collector Hazelle Howard encouraged me in my new hobby, persuaded me to join the Conchology Section of Auckland Museum, and sent off some of my shells for identification. These eventually came back with names that were new and strange to both of us: *Zelippistes benhami*, *Natica migratoria*, *Talabrica bellula*, *Scintilla stevensoni*, *Daphnella cancellata* and *Nassarius spirata*. The *Nassarius* was a new arrival in New Zealand, and more of them turned up alive at Tryphena from time to time.

Struthiolaria papulosa were common alive on the mudflat. Other Tryphena species were *Struthiolaria vermis*, *Fossarina rimata*, *Rissoina zonata*, *Austrotriton parkinsoni*(one), *Murexsul octogonus*, *Murexsul aspinosus mariae*, *Amalda novaezelandiae* plus white form *crystallina*, *Marginella pygmaea* and *M. mustelina*, *Tomopleura albula*, *Duplicaria tristis*, *Cylichna thetidis*, *Gregariella barbata*, *Cardita brookesi*, *Myllita stowei*, *Nemocardium pulchellum* and *Thracia vitrea*.

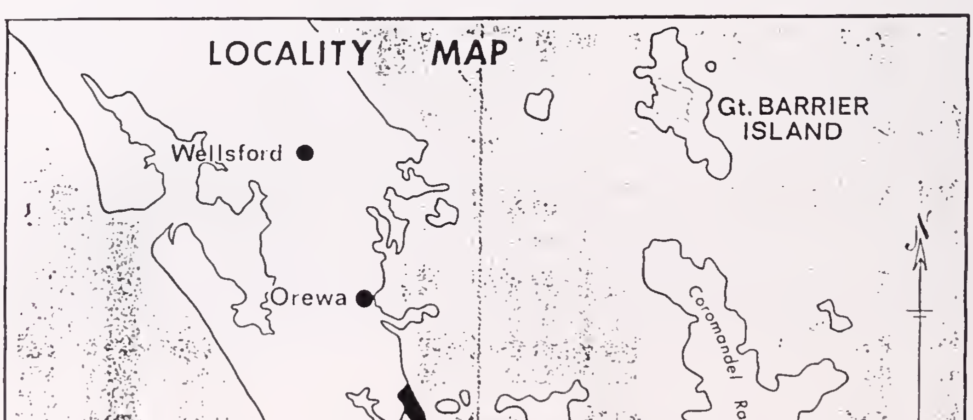
In the old decaying hulk of the "Veritas" were the largest *Teredo* I have ever seen, and many small *Buccinulum* also found a home there, identified by Phil Warren as *B. vittatum vittatum*.

Over on the east coast, Kaitoke and Medlands Beaches were mostly swept bare, and I had few opportunities to visit there anyway. But they yielded a few extra species, *Cantharidus opalus* and *C.purpureus*, *Monodilepas diemenensis*(one), *Clanculus peccatus*, *Calliostoma tigris*, *C. punctulata* and *C. osbornei*, *Philippia lutea*(one), *Janthina violacea*, *J. exigua* and *J.globosa*, and one cuttlebone, *Sepia apama*.

I didn't develop much interest in landsnails, but *Schizoglossa barrierensis* was common in our bush, alive under fallen Nikau fronds, and *Placostylus hongii* very restricted in locality further round the coast.

But despite Great Barrier being one of the best places for *Paper Nautilus*, I never did find one.

One day I met a man on the beach who wanted to know what I was doing. "Collecting shells," I told him. "What a waste of time!" was his response, "you'll only throw them away." I wish I could tell him, forty years later, that I didn't throw them away. Instead, my interest in shells expanded to include snails, fossils and rocks, tramping and exploring, climbing mountains, photography, bird-watching and botany. And because I wanted to know how everything got here, and got to be the way it is, I delved into the Evolution Theory, and later found a far more satisfying explanation in the Bible and Creation Science.



<u>1994</u>: As I was leaving my friend Jessie's home, she passed me her *Forest and Bird Magazine* — "You might like to read this." Of course I would — I'm always interested in anything to do with our wildlife. What's this?... an article on Great Barrier Island... that should be interesting. It was! But I wasn't prepared for the desire that filled me. "Great Barrier Island calls! My hungry heart is yearning" to see all the familiar places again, plus the larger part of the Island I had never had a chance to see as a child. I tried to talk myself out of it... Don't be silly Bev, it's too far away, too much hassle getting there and too expensive; there's plenty of places nearer to home to explore and you've already got this summer's trip to West Nelson planned. Forget it! But... it wouldn't hurt just to inquire at the Travel Agency. The Travel Agency knew nothing. "Try the Information Centre," was all they could tell me. The Information Centre provided a leaflet, which I took back to the Travel Agency, and then showed it to my best friend. Olive, always a mine of information on topics of general interest, immediately produced a list of Air N.Z.'s economy fares. So, it wouldn't be so very expensive... maybe... A few days later the Travel Agency had obtained a Great Barrier Airlines timetable for me. But that was as far as they were prepared to go. "You'll have to do your own bookings!"

I walked into the Air N.Z. office in central Christchurch, with the information and timetable I'd acquired. "I want to fly to Great Barrier Island," I told the lady there, "but *only* if it can be done in one day, without any hassles of trying to find transport or accommodation in big cities!" I am almost as out-of-place in cities these days, as I was when I left Great Barrier Island as a shy and awkward teenager. When at last the Air N.Z. computer churned out an itinerary for me, I knew the Lord meant me to go back to my island home.

The great day, December 13th, arrived at last, and started with a such cloudburst that I wandered if I would even be able to get out of Kaikoura, at 4.00a.m! Twelve hours later, when I landed at Claris Aerodrome on Great Barrier, it was fine and sunny. I walked down the Airstrip onto Kaitoke Beach. Out came the notebook and pen, and I started on lists of shells, birds and plants, while revelling in the beautiful scenery, and the peace and quiet, a welcome contrast to the hurly-burly of Auckland Airport. I was delighted to find Brown Teal. I dimly remembered them from my childhood, and hoped I might be lucky enough to see one. And here were eighteen of them on my very first evening, and close enough to photograph too! Within a few days I had discovered that they are a very common bird on the Island.

Next morning I was out on the beach early, sharing the area with a pair of nesting Black Oystercatchers and two pairs of New Zealand Dotterels. High tide during the night had left a line of fine beach drift, and I made slow progress on my knees, notebook in hand, surprised at the number of species to be found on this open ocean beach. Each of the east coast ocean beaches has an estuary which provides habitat for species of shells that I had expected to find only on the sheltered west coast of the Island, and I soon abandoned the idea of doing separate east coast and west coast lists, as there isn't sufficient difference to warrant it. In the afternoon I walked along Medlands Beach, and found at the southern end a quiet camping spot, high cliffs with spectacular coastal views, and quite a good spot for shells. Of course I wasn't actually collecting, as anything I picked up had to be carried for 3½ weeks, but I did gather up a few small light species, and a *Monoplex parthenopeus*.

Next day I headed up and over the hill to Tryphena and "Home". The warm welcome I received, the things that had changed and the things that had not, and the tremendous emotional experience of going back to the home my Dad built forty years ago, are all outside the scope of this article. It was a dream come true; I could hardly believe it was actually happening to me.

I pitched my tent in a quiet corner... no, not so quiet, for the tree-tops were full of screeching kakas, the commonest bush bird on the Island. And there were 32 Brown Teal on the sea below. I stayed there for six days, doing big walks each day. Two of the longest were to Rosalie Bay and Cape Barrier, at the southern end of the Island. Both were boulder beaches with nothing in particular in the way of shells. At Shoal Bay *Musculista senhousia* was plentiful. *Limaria orientalis* has found its way to the Barrier too, and a few *Crassostrea gigas*. The full moon low tides at Tryphena were rather disappointing. Spring tides were still two weeks away. But it was easy to see that the many Lace Shells and Brown Bubble and White Bubble Shells which had aroused my interest forty years ago, were almost entirely missing. *Cantharidus purpureus* was very common however, and I saw many live *Trochus viridis* while diving and one *Chromodoris amoena*.

The little stream that once had many good large *Latia neritoides* and *Potamopyrgus antipodum* has been greatly altered, and while *P. antipodum* is still there, the other species has vanished.

Back over the hill at Medlands Beach again, I was down on hands and knees doing the tide line by Memory Rock in the centre of the beach. I was exulting over a perfect wee *Mondilepas diemenensis* (same spot as my 1950's one), when I spotted a larger-than-usual wave approaching. And all my gear was only a couple of metres above the tide line! I hauled my pack to safety with not an instant to spare, while the water swirled around everything else. I retrieved my sodden notebook, boots, knife, sunburn cream and — I couldn't believe it — even the little pile of shells I'd collected had been washed only a short distance. But one jandal went floating merrily out to sea, and I decided it wasn't worth the risk of plunging into the surf to try to retrieve it. It's not often that I contribute anything to the man-made rubbish that litters our beaches.

I left a packet of shells underneath the office building at Claris Aerodrome, tried unsuccessfully to buy jandals at Claris Store, and headed for Whangaparapara. A disappointing place for shells, but a good base for several long tramps over the next few days. A pair of Black Oystercatchers with two chicks lived just around the corner from the campground. Banded Rails were common, and much more inclined to show themselves than is usual for this secretive bird; there was a Reef Heron, the usual Woodpigeons and Kaka and of course Brown Teal, fourteen of them.

Christmas was not particularly merry — the only day of my holiday that dawned raining. I filled in a couple of hours swatting mosquitoes that were sharing my tent... they certainly enjoyed their Christmas dinner!... and having slaughtered over 100 of them, I settled down for a more peaceful sleep than I'd had during the night, until a beam of sunlight told me it was time to get out exploring. I walked around the Harbour to the Old Whaling Station, and was disappointed to find it a dirty untidy mess, with nothing worth seeing. I still have Baleen and Whale Barnacles from their first whale, caught in 1956.

I tramped to Port Fitzroy along the old forestry road, finding a *Latia neritoides* in Kiwiriki Creek on the way. There was not much in the way of shells at Port Fitzroy. My main interests in this middle part of the Island were tramping the network of walking tracks and botanizing. The bush was beautiful, and the nearer one got to the top of Mt. Hobson, the highest point on the Island, the better it became, with Tawari(*Ixerba brexioides*) being my special favourite among the many trees that were in flower. I climbed Mt. Hobson three times in one week, from three different angles, and all three are well worth doing.

I was fortunate to get a ride to Whangapoua Campground, which not only saved me a long hard slog, but landed me there right at low tide. I left my pack, and headed straight out to the beach. With only six days left, I began to collect a few shells. But I couldn't spend much on the beach, as the stream that has to be crossed is almost a meter deep, even at low tide. It's a dangerous spot, especially if you're carrying a camera that must be kept dry. Harataonga was better, a lovely sandy beach, beautiful scenery and a good safe spot to dive. For a southerner like me, finding live *Charonia capax* was a real thrill. Two fellows had been diving for Paua and they gave me one of their shells. Barrier Paua are pinker than Kaikoura specimens. They let me examine their other Paua too, and I obtained several *Radiacmea inconspicua* and two little chitons which I couldn't identify at the time. A little *Hyridella menziesi* in the creek was unexpected, as there are no lakes on the Island.

On to Awana; a low spring tide, but a howling wind made it unpleasant. Thankfully, I was in my tent when the first really strong gust struck, and lifted it right out of its sandy foundation. I was able to find enough rocks and pieces of wood to anchor it securely. Some of the other campers were having real problems, as the wind whisked tents and belongings around.

It's not surprising that I never collected Chitons when I lived on the Barrier, as the only common ones at Tryphena are *Chiton (Sypharochiton) pelliserpentis* and *Chiton (Amaurochiton) glaucus*, not likely to inspire a young collector. But low spring tides on the east coast turned up some of the larger species — *Eudoxochiton nobilis*, *Guildingia obtecta*, *Diaphoroplax biramosus* and *Notoplax violacea*. And *Cryptoconchus porosus* must be there too, as I found one valve.

Here at Awana my remaining jandal collapsed. I still had my tramping boots, but was getting used to going barefooted on the beaches, and even on the rocks, like I did forty years ago. Next morning I arrived back at Claris Store. "Any jandals yet?" "Oh yes!" Eagerly I dived into the footwear box, and fished out the two remaining pairs. Size 3, and size 12. Needless to say, I'm halfway in between!

Back to Kaitoke Beach, where the Great Adventure had started. Kind friends let me camp on their property, close to the beach, for the last two days. Kaitoke is probably the most beautiful beach of all, as well as being the best one for shells... or maybe that's just because there were spring low tides morning and evening, and I certainly made the most of them, walking for many miles, and collecting every species I could find. One method of collecting was very productive. I scraped up handfuls of crab-infested shells from the edges of rock pools, threw them all into the centre of the pool, and sorted out what I wanted as they scuttled for cover. In this way I found *Nassarius spiratus*, *Natica migratoria*, *Rissoina zonata*, *Philippia lutea*, *Semicassis labiatum*, *Calliostoma punctulata*, *Murexsul espinosus mariae*, *Buccinulums*, *Paratrophon quoyi* and *Phenatoma zelandica*. Under a rock, all

together, were six *Aplysia parvula*, and I gathered them all up, put them in a shallow pool, and took a photo of these strange little sea slugs, before taking the two largest, and putting the rest back where I found them. I found two live *Monia zelandica* in a rock pool.

I left Great Barrier on January 6th, after the most wonderful trip of my life, and arrived back at Auckland Airport, bare-footed, with a pack so heavy I could hardly lift it, and thoroughly contented. I finally found a pair of jandals for sale in Blenheim, and arrived safely back in Kaikoura that evening.

I can imagine Margaret Morley throwing up her hands in horror at all the very tiny treasures I must have missed, and Jim Goulstone tearing his hair out at the thought of all the land snails I didn't even try to find. Sorry folks, it's just not possible to be interested in absolutely everything, especially with failing eyesight. I trust you'll have the opportunity to go there yourselves, and fill in the gaps in my list of species.

GREAT BARRIER ISLAND

SPECIES LIST
GREAT BARRIER ISLAND

POLYPLACOPHORA

Acanthochitona zelandica
Amaurochiton glaucus
Cryptoconchus porosus
Diaphoraplax biramosus
Eudoxochiton nobilis
Guildingia obtecta
Ischnochiton maorianus
Notoplax violacea
Onithochiton sp.
Sypharochiton pelliserpentis

GASTROPODA

Agnewia tritoniformis (1960's, Gay Mitchener)
Alcithoe swainsoni
Amalda australis
Amalda depressa
Amalda novaezelandiae
Amalda novaezelandiae crystallina form
Amalda mucronata
Amphibola crenata
Antisolarium egenum
Aplysia parvula
Argobuccinum tumidum
Astraea heliotropium
Atalacmea fragilis
Austrofusus glans
Austrotriton parkinsoniana (1950's only)
Buccinulum lineum
Buccinulum bicinctum (looks like my Chatham Island one)
Buccinulum robustum (P. Warren id., 1950,s only)
Buccinulum vittatum (small, Phil Warren id.)
Bulla quoyii
Bulla vernicosa
Bullina lineata (1960's, Gay Mitchener)
Bursatella glauca (1950's only)
Cabestana spengleri
Calliostoma pellucida spirata (1950's only)
Calliostoma punctulata
Calliostoma tigris
Cantharidella tesselata
Cantharidus purpureus
Cantharidus opalus
Cellana radians
Cellana stellifera
Cellana ornata
Charonia rubicunda (1960's Gay Mitchener)
Charonia capax
Chemnitzia sp.
Chromodoris amoena
Cirsotrema zelebori
Comitas trailli (1950's only, Phil Warren
Clanculus peccatus (1950's only)
Cominella virgata
Cominella quoyana
Cominella maculosa
Cominella adspersa
Cominella glandiformis
Cookia sulcata
Crepidula monoxyla
Crepidula costata
Cylichna thetidis (1950's only)
Daphnella cancellata (1950's only)
Diloma arida
Diloma coracina
Diloma zelandica
Diloma subrostrata
Diloma bicanaliculata
Duplicaria tristis
Eatoniella huttoni (1950's only)
Emarginula striatula
Epitonium tenellum (1950's only)
Epitonium minora
Epitonium jukesianum
Fossarina rimata (1950's only)
Gadinalea conica
Haliotis iris
Haliotis virginea crispata
Haliotis australis
Haminoea zelandiae
Haustrum haustorium
Helix aspersa
Herpetopoma larochei (1950's only)
Herpetopoma bella (1950's only)
Janthina globosa (1950's only)
Janthina exigua (1950's only)
Janthina violacea
Lamellaria ophione
Latia neritoides
Lepsiella scobina
Littorina unifasciata antipodum
Maoricolpus roseus roseus
Marginella pygmaea
Marginella mustelina (1950's only)
Marinula filholi
Mayena australasia
Melagraphia aethiops
Melanopsis trifasciata
Micrelenchus sanguineus
Micrelenchus dilatatus
Micrelenchus rufozonus
Modelia granosa
Monodilepas diemenensis
Monoplex parthenopeus
Murexsul octogonus (1950's only)
Murexsul espinosus mariae
Nassarius spiratus
Natica migratoria
Neoguraleus sinclairi (P.Warren id.)
Neoguraleus murdochi (P.Warren id.)
Neoguraleus lyallensis (P. Warren id.)
Neoguraleus interruptus (P. Warren id.)
Neoguraleus tenebrosus (P.Warren id.)
Nerita melanotragus
Notoacmea pileopsis pileopsis
Notoacmea helmsi
Notoacmea parviconoidea

Notoacmea daedala
Onchidella nigricans
Ophicardelus costellaris
Paratrophon quoyi
Patelloida corticata
Penion sulcatus
Penion dilatatus
Phenatoma zelandica
Philine angasi
Philippia lutea
Placostylus hongii (1950's only)
Potamopyrgus antipodum
Potamopyrgus pupoides
Proxiuber australis (1950's only)
Pupa kirki
Radiacmea inconspicua
Risellopsis varia (one only)
Rissoina chathamensis
Rissoina zonata
Schizoglossa novoseelandica barrierensis
Scutus breviculus
Seila chathamensis (1950's only)
Semicassis collactea
Semicassis labiatum (1966, Gay Mitchener)
Semicassis pyrum
Serpulorbis zelandicus
Sigapatella novaezelandiae
Siphonaria zelandica
Siphonaria cookiana
Stephopoma roseum
Struthiolaria vermis vermis
Struthiolaria papulosa
Tanea zelandica
Taron dubius
Thais orbita
Thoristella oppressa (1950's only)
Tomopleura albula (1950's only)
Tonna cerevisina
Triphora infelix (1950's only)
Triphora fascelina aupouria (1950's only)
Trivia merces (1950's only)
Trochus viridis
Tugali elegans
Tugali suteri suteri

Turbo smaragdus
Turritriton exaratus
Xenophora neozelanica (1950's only)
Xymene plebeius
Xymene traversi
Xymene ambiguus
Zeacolpus pagoda
Zeacolpus vittatus
Zeacumantus subcarinatus
Zeacumantus lutulentus
Zegalerus tenuis
Zelippistes benhami (1950's only)
Zethalia zelandica

BIVALVIA

Acar sociella
Anchomasa similis
Anomia trigonopsis
Atrina zelandica
Austrovenus stutchburyi
Barbatia novaezelandiae
Bassina yatei
Cardita brookesi
Chlamys zelandica (*zeelandona* form)
Chlamys zelandiae
Corbula zelandica
Crassostrea glomerata
Crassostrea gigas
Diplodonta globus
Diplodonta zelandica
Diplodonta striatula
Divaricella huttoniana
Dosina zelandica
Dosinia anus
Dosinia maoriana
Dosinia subrosea
Gari stangeri
Gari lineolata
Glycymeris laticostata
Glycymeris modesta
Gregariella barbata
Hiatella australis
Hyridella menziesi
Limaria orientalis
Limatula maoria
Lithophaga truncata
Longimactra elongata
Macomona liliana
Mactra ovata
Mactra discors
Mesopeplum convexum (1950's only)
Modiolarca impacta
Modiolus areolatus
Monia zelandica
Musculista senhousia
Myadora striata
Myadora boltoni
Myllita stowei
Myllitella vivens
Mytilus edulis aoteanus
Nemocardium pulchellum
Notirus reflexus
Notocallista multistriata (1950's only)
Nucula hartvigiana
Nucula nitidula
Offadesma angasi
Panopea zelandica
Paphies subtriangulatum
Paphies australis
Pecten novaezelandiae
Perna canaliculus
Pholadidea tridens
Philobrya sp.
Pleuromeris zelandica
Ruditapes largillierti
Scalpomactra scalpellum
Scintilla stevensoni (1950's only)
Soletellina nitida
Spisula aequilateralis
Talabrica bellula (1950's only)
Tawera spissa
Tellina gaimardi

Tellina huttoni
Teredo sp.
Thracia australica novozelandica (1950's only)
Venerocardia purpurata
Xenostrobus securis
Xenostrobus pulex
Zearcopagia disculus

CEPHALOPODA

Sepioteuthis bilineata (1950's only)
Sepia apama (1950's only)
Spirula spirula
Octopus maorum
Argonauta nodosa (not found by me but I saw plenty found by others)

PERIODICALS:-

Gloria Maris Vol. 33 1994. is a "CHRONOLOGICAL LIST OF THE DECEASED CONCHOLOGICAL AUTHORS" compiled by J. Christiaens. In introduction he says "--- as it is often useful to know the lifedates (birth and death) of the main authors(to verify the priorities, to find out if a paper has been published posthumously, to state at what age or in which sequence the author has written his works, to be able to connect each writer with his contemporaries, to turn a name into a person or a period) I publish a bibliography ---"
As well as dates some information about each author includes mention of important publications.Of course every author has not made the list and so we do not find entries for a few N.Z. favourites like Murdoch; on the other hand a few interesting historic figures are included, e.g. Gandhi, Newton and Van Diemen. Unfortunately it is not clear which of the names are not "authors" and so I am left wondering which shells were named by Queen Ann, Bob Penniket, Mahomet, or Lady Wonder the telepathic horse?

Unfortunately the entries are limited to one line which sometimes leaves us with just a tantalising clue.

The catalogue is listed chronologically and in the back an index of authors is listed alphabetically making this a very useful quick reference.

Apex for December 1994 has a review of the *Fulvia* genus in the *Cardiidae;* discriptions of the *Muricidae* of Madeira including a new *Ocenebra*; more on Olives and a study on the chemistry of the African landsnail *Achatina fulica.*

After a gap of some years Levantina is back in production and hopes to be regular twice a year.Levantina is the Journal of the Israel Malacological Society and No 80 July 1994 has articles on Mediterranean and Red Sea molluscs, fossils, land and fresh water snails and, quite fascinating, "How the Octopus helped discover New Zealand" by B.S.Singer.An interesting tale from the Cook Islands that I have not heard before!
Solly B. Singer is the editor and now that Levantina is back in regular production he hopes to have more subscribers.For more info see the Journal in YOUR library.

Just in is Novitates for 1994. This edition is a catalogue of the type specimens of the micro-invertebrates in the collection of the American Museum of Natural History. It does not include any of the Phylum Mollusca.

Our new members may not know that we exchange Poirieria for the following magazines from other clubs:-
Novitates from the American Museum of Natural History.
Newsletter of the Cairns Shell Club.
Nautilus
Thomas Rice's lists
Basteria from the Netherlands Malacological Soc.
Apex and Arion from the Societe Belge de Malacologie.
Siratis from the Conchology Soc of Brazil.
Gloria Maris from Belgian Soc for Conchology.
Levantina from the Israel Malacological Soc.

-

H.J.FINLAY 1901 - 1951

by Nancy Smith

In 1937 the Auckland Institute and Museum bought the mollusc collection of Dr Harold Finlay. It comprised 14,000 species lots of recent and fossil mollusca including 437 type specimens, most of them introduced by Finlay himself. e.g. *Iredalina mirabilis* Finlay, 1926 and *Larochia miranda* Finlay, 1927. Many of our genera and subgenera are also his e.g. *Maoricolpus* Finlay 1927, *Antisolarium* Finlay 1927 and subgenus *Paraclanculus* Finlay, 1927. The recent species are mostly beachworn and not in good condition and some of the names have been updated. (See B.W. Hazelwood article on *Provocator mirabilis* in this edition! - Ed.)In addition about 20 recent species and 46 fossil species of the N.Z. mollucsa have been named **for** this man. So we have *Buccinulum pertinax finlayi* Powell,1929; *Neoguralius finlayi* Powell, 1942; *Terenochiton finlayi* (Ashby, 1929) Genus *Finlayola* Laws,1937. We know the author Finlay very well. But what do we know of the man?

Harold Finlay was primarily a paleontologist with a high reputation in his field. His major works were joint publications with John Marwick, another important name in N.Z. molluscan records.A quick ,clever, self-confidant man with a remarkable memory, Finlay drove himself hard and expected no less of those he worked with. I have seen him described as "abrasive", "aggressive", "assertive". He showed no self pity and not much mercy at least in the public arena. But Finlay was battling a severe handicap.

Born in India, crippled there with poliomyelitis and orphaned by his father's early death, he came as a child to N.Z. The family were not well off and Finlay's wheelchair precluded him from working his way through university but he gained scholarships and fellowships at Otago. Also because of his disability he was not allowed to take geology for his degree so instead took chemistry (with Honours) as well as studying physics poetry and music. He then went on to do his doctorate in geology. After a few years with the Fisheries Dept and then the Vacuum Oil CO he had a couple of difficult years without full employment during the depression, but in 1937 gained the position of micropaleontologist with the New Zealand Geological Survey and worked there till his death in 1951.

In 1939 Dr Harold Finlay was elected Fellow of the Royal Society of N.Z.

Although paleontology was his main interest Harold Finlay had an abiding passion for all science, loved philately and music (he wrote original orchestral compositions), played bridge, worked for animal welfare, drew "fat cats" for his daughters and lived a very full if short life.

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Finlay M. 1951 H.J.Finlay (Harold) 1901 - 1951 Newsletter of the Geological soc. of N.Z.
Cernohorsky W.O. 1972 Type Specimens of Recent & Fossil Mollusca Described by H.J.Finlay.

Key to the New Zealand species of Amphiuridae.

by Fiona Thompson

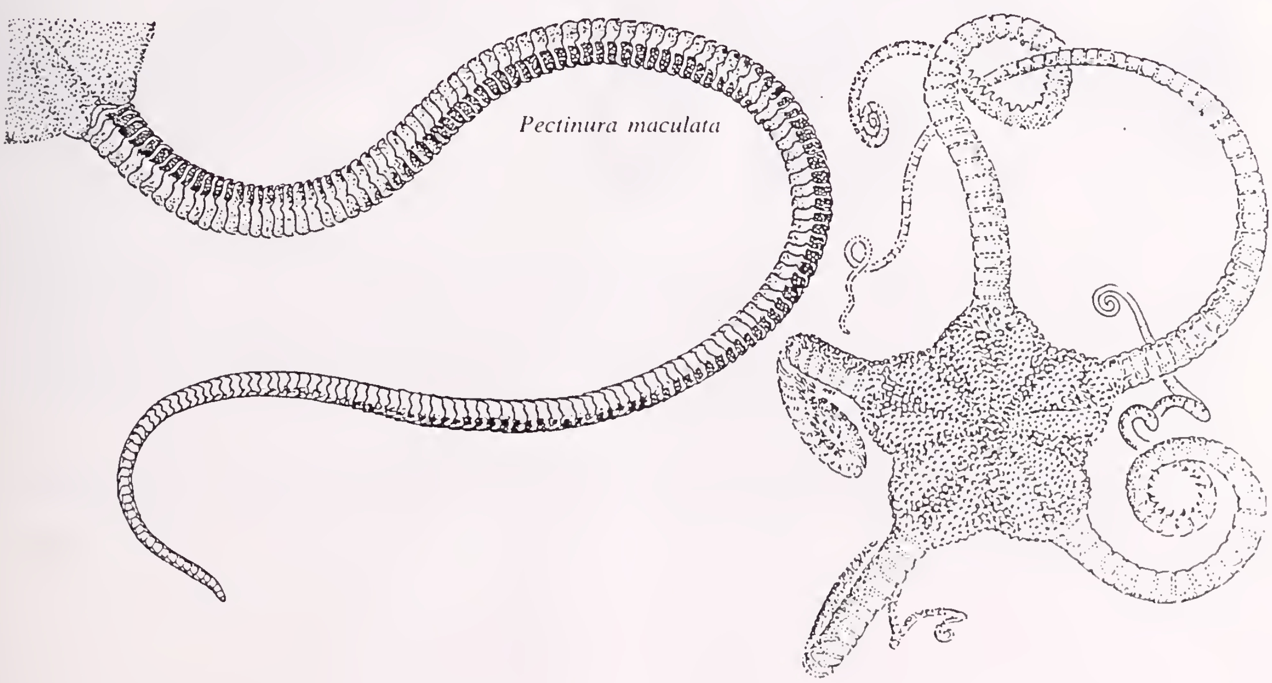
Having agreed to learn what I could about Echinodermata, i.e. Sea eggs, Starfish and Brittle stars, in order to identify them, I hadn't realised quite how much there was to learn. Just the New Zealand ones alone, of which a trickle are constantly being added to the taxa, are only a very small fraction of the world wide varieties.

Since this hasn't been the focus of marine work in Auckland, there is singularly little information on this family available, and the nearest expert, Dr Helen Rotman is in Wellington and only intermittently available for consultation. So I was very fortunate indeed to have the opportunity to go to the Zoologiske Museum of Copenhagen and meet with Dr Margit Jensen, who is the Curator of the Mortensen collection.

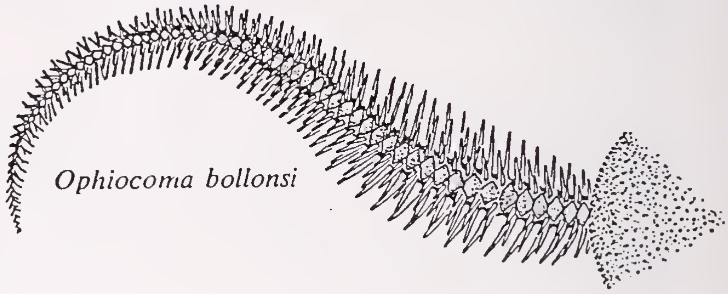
The Mortensen collection is an international treasure, gathering together specimens from various expeditions to the Southern oceans, and is an extensive one, both wet and dry, which it was a great privilege to see. Following Dr Mortensen and subsequently Dr Madsen, Margit Jensen is a large hearted lady, generous with her knowledge, which is considerable.

Filling some of the many gaps of my ignorance, she explained, point by point the key by which to identify Ophiuroids and Amphiura using Mortensen's Key. This is a relatively simple check list of basic points which can be matched against following data.

The 5 days I had with her, 3 of which were spent as a minimally paying guest at a University guest house, a modern house tucked into a garden just across the lawn from the Museum; were too short to do much more than learn about the specimens I had taken with me.

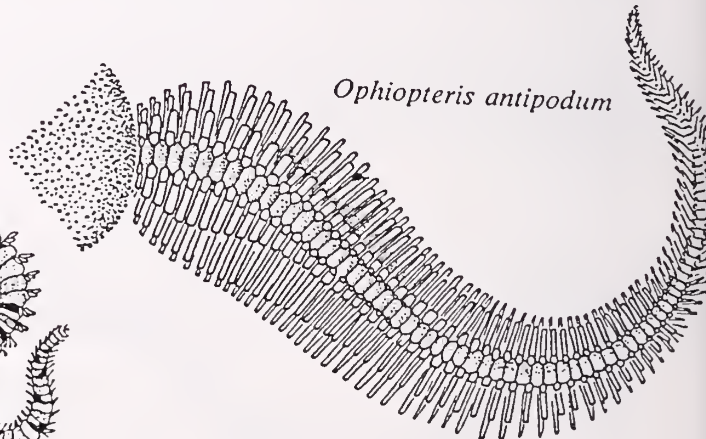


Ophiomyxa brevirima

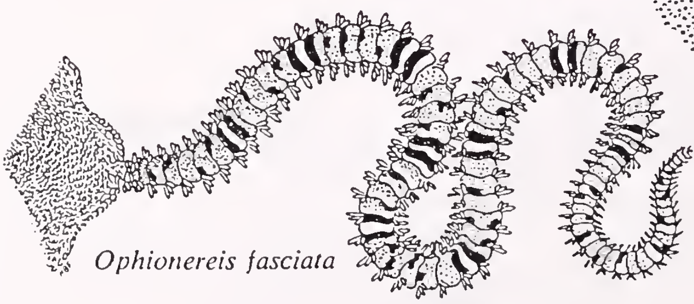


Ophiocoma bollonsi

Brittle stars always have 5 arms from a central disc, unlike starfish which vary between species and indeed within species. The differences are sometimes obvious. Gorgonocephala have 5 arms multi-branched and are unmistakable: some of the larger varieties of Ophiuroidae can be distinctive such as having stripes, like the *Astroporpa wilsoni* clinging to Gorgonia. In the smaller brittle stars such as *Ophioneries fasciata,* the mottled arms of grey and charcoal are clear; *Ophiopteris antipodum* is a velvety dark brown with a thick fringe of spines along both sides of each arm.



Ophiopteris antipodum



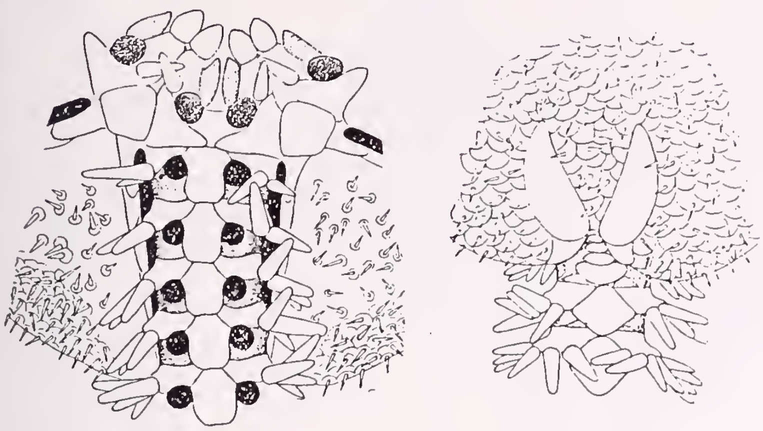
Ophionereis fasciata

As a rough guide, Amphiura have double teeth at the apex of the mouth part, and Ophiura a series of teeth around the oral plate. Finding the tentacle scale in the arms needs a microscope and if the speciman is a small blob of jelly, it's correspondingly harder. In some species the only difference can be as small (I use that word in both senses) as between one tentacle scale and two tentacle scales.

However the satisfaction of correctly identifying the animal in front of you is considerable.

1. Oral papillae forming a continuous series along each side of jaw; more than one outer oral papilla..13
Only a single outer oral papillae, widely separated from the inner, infradental papilla; in the interval between these papillae there is one situated at a lower level in the mouth, belonging to the first tentacle..2
2. Two tentacle scales at least in the proximal part of the arm. No spines on the disc...3
Only one tentacle scale; no spines on the disc...7
No tentacle scales; spines on the disc.

Amphiocnida pilosa (Lym.)



3. Two tentacle scales in the whole arm length...4
Only a few of the proximal joints with two tentacle scales, farther out only one; arms very long; 7-6 armspines.

Amphiura aster Farquhar.

4. Oral side of disc naked; 4 armspines.

Amphiura norae. Benham.

5. Spines (6-7) distinctly flattened.

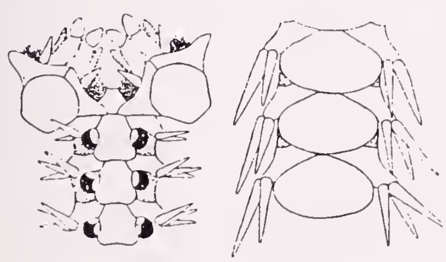
Amphiura amokurae. Mortensen.

Spines not flattened...6
6. Oralshields spear-head shaped, distinctly longer than wide; radial shields very small.

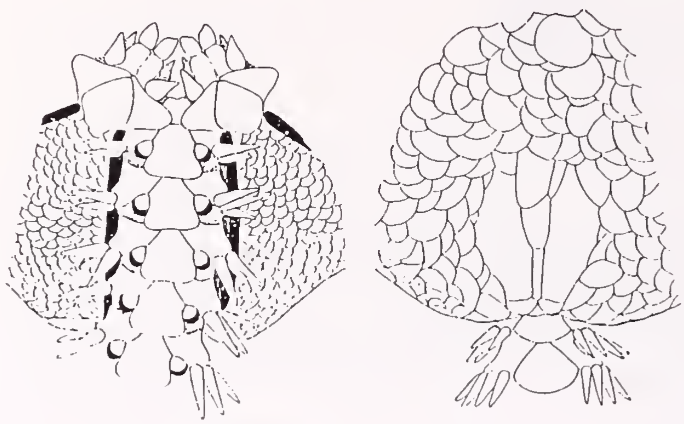
Amphiura eugeniae. Ljungm.

Oral shields rounded about as wide as long; radial shields rather long.

Amphiura rosea. Farquhar.



7. Oral side of disc naked. *Amphiura hinemoa.* Mortensen.
Oral side of disc completely covered with scales.......................................8
8. Lowermost spine on the middle part of the arm much elongated and slightly curved, downwards directed...9
Lowermost spine not much elongated...10
9. Viviparous, hermaphroditic; armspines rather coarse.
Amphiura magellanica. Ljungm.
Not viviparous; sexes separate; armspines rather delicate.
Amphiura spinipes. Mortensen.
10. Tentacle scale small, triangular...11
Tentacle scale large, leafshaped..12
11. Viviparous, hermaphroditic; oral shields triangular; 4 armspines.
Amphiura annulifera. Mortensen.
Not viviparous, sexes separate; oral shields spearhead shaped;
6-5 armspines.
Amphiura alba. Mortensen.

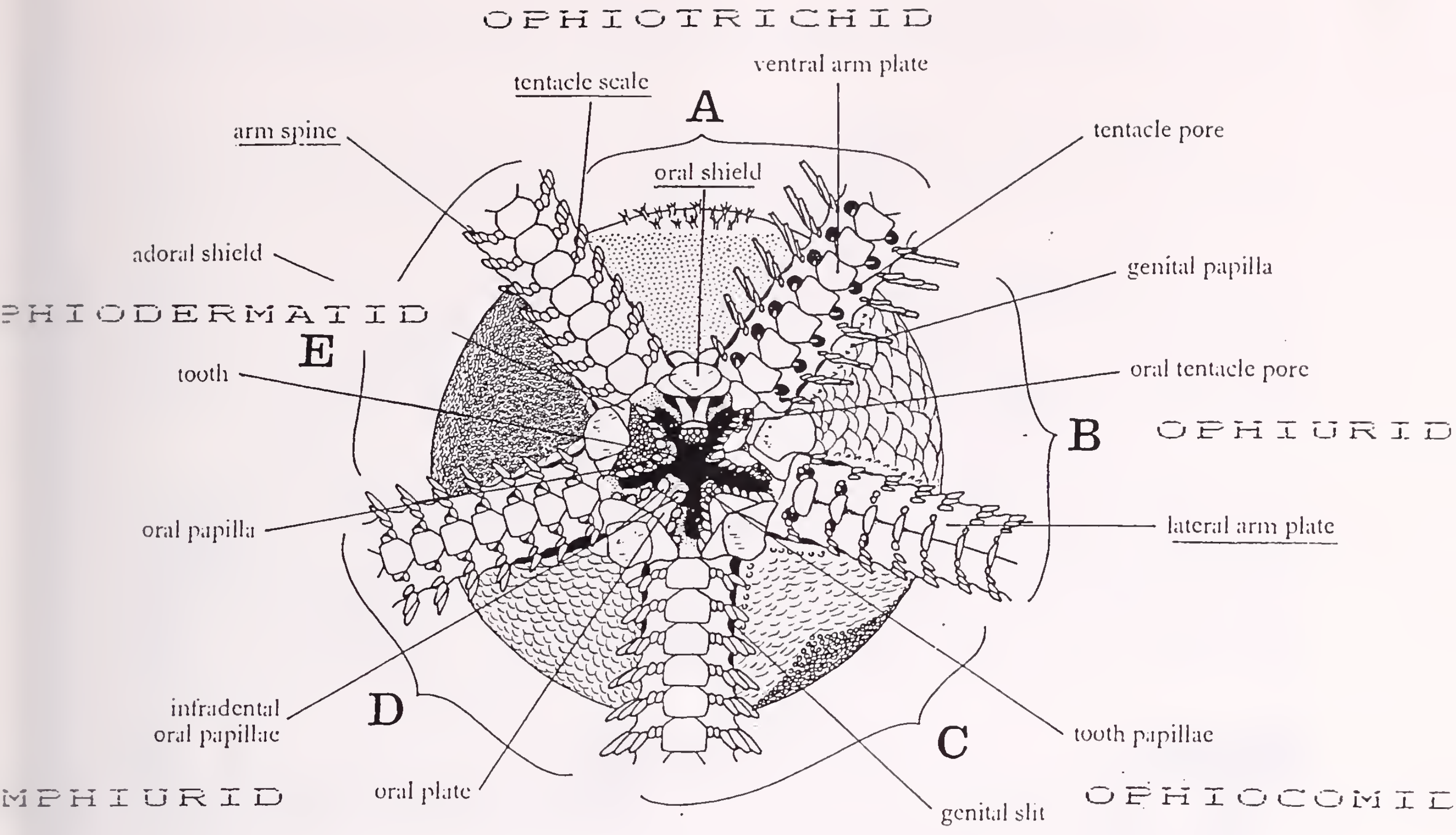


12 Oral shields triangular; ventral plates wider than long, corners not rounded; 5-4 armspines. *Amphiura praefecta.* Koehler.

Oral shields roundly heart shaped; ventral plates longer than wide, with rounded corners; 6 armspines.
Amphiura pusilla. Farquhar.
13. Outer oral papilla very broad; radial shields contiguous; viviparous, hermaphroditic.
Amphipholis squamata. (D.Ch.)
Outer oral papilla not very broad; radial shields not contiguous;
not viviparous, sexes separate.....14

14. Four lateral oral papillae; oral shields short, triangular;disk on both sides completely covered with scales.
Amphioplus basilicus. Koehler.
Three lateral oral papillae; oral shields elongate, with straight outer edge. Disk (probably) nearly naked.
Ophionephthys stewartensis. Mortensen.

Acknowledgements to Mortensen & Fell



b

New Zealand Specimens

Amphiura rosea

Ophionereis fasciata

Amphiocnida pilosa

Ophiozonoida picta

Amphiura alba

Mouth parts to the left of arm

MEMORIES OF AITUTAKI

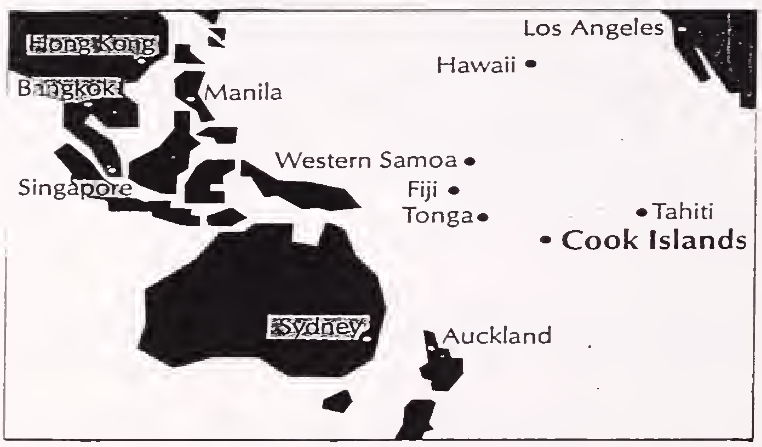
by **Margaret S. Morley**

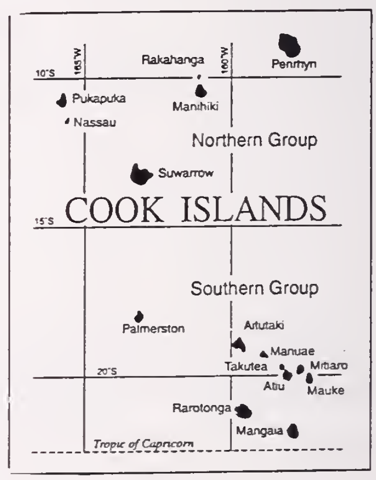
In August 1989 my father, sister and I spent three weeks on Aitutaki in the Cook Island group. My nephew and his Cook Island wife live there, so we were privileged to be part of island life for a short time.

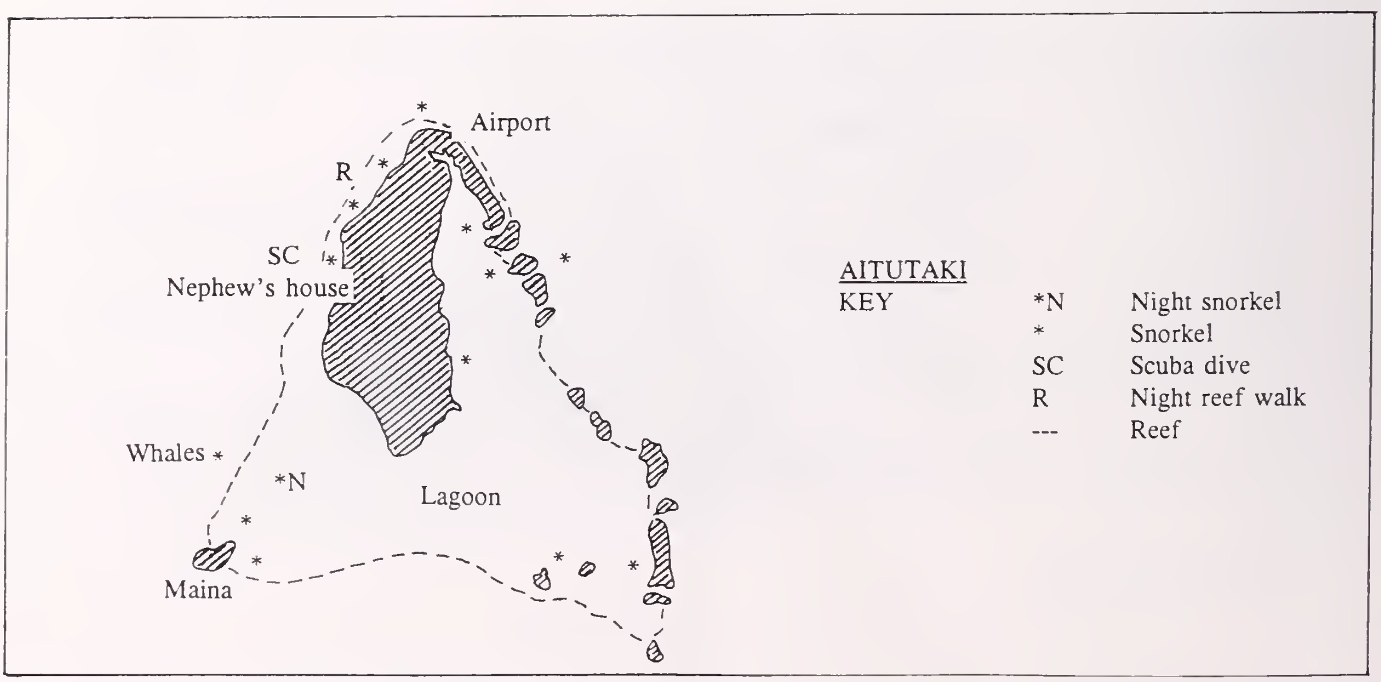
We were taken by boat to many of the *Motu* or islands that encircle the large lagoon. Island picnics are a delight with fresh coconut drinks and fish trawled from the sea, cooked at once over an open fire. The snorkelling was magnificent and I was seldom out of the water.

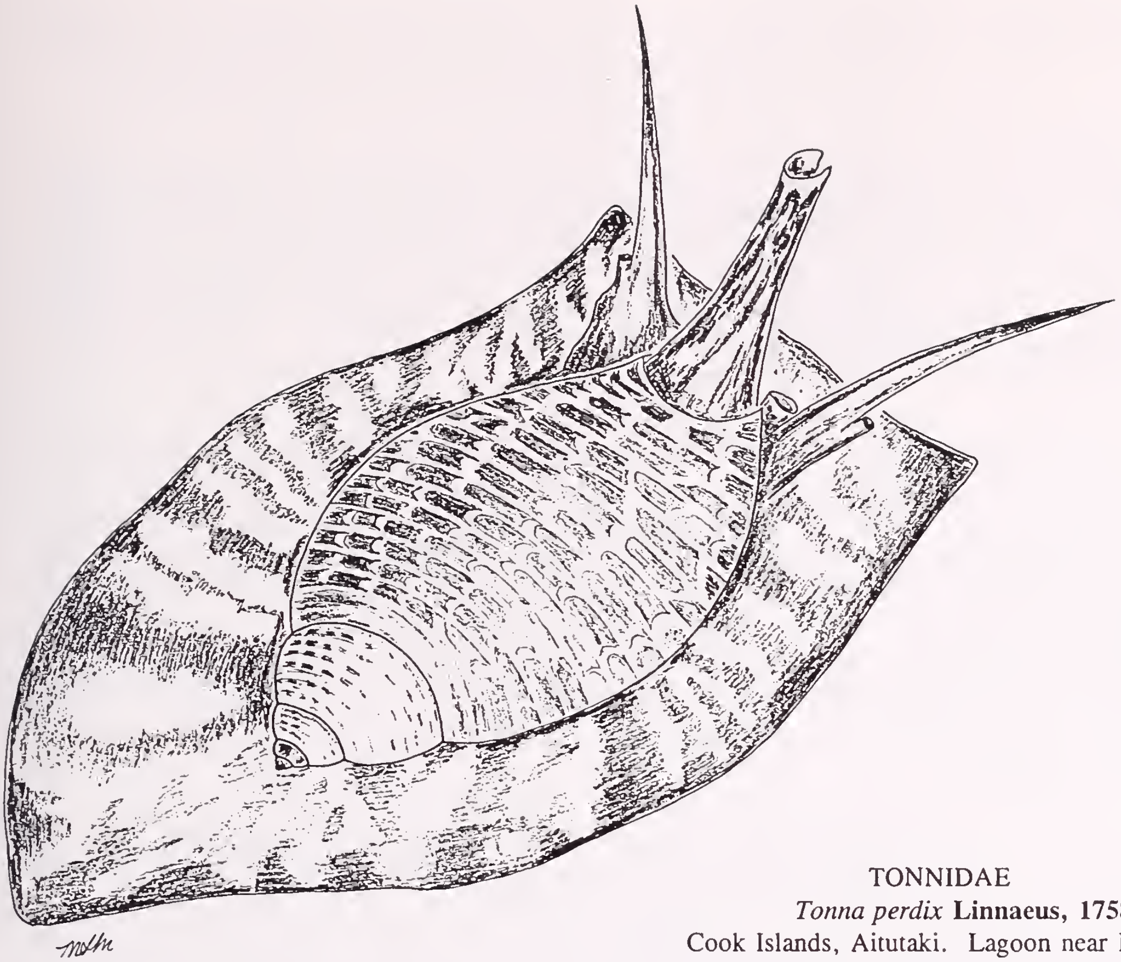
I was also assigned a motorbike to take me to the shelling spots around the main island. This vehicle proved more reliable than it looked. The ignition key was prone to jumping out when jolted over the rough coral roads, despite this the engine continued to run! My favourite snorkelling place was the lagoon near the airport where the reef was within one hundred metres of the beach. The colourful shoals of fish distracted me from looking for shells. However, I did collect a total of 125 different species during the visit.

On a moonlit night we paddled an outrigger canoe to the reef on the west side of the island. Here the lagoon is one kilometre wide. My nephew and his wife were well equipped with kerosene lanterns and with practised ease leapt nimbly from coral head to coral head. Far less surely and with an inadequate torch I attempted to keep up with them... - not an ideal collecting situation! They gleefully chased and caught crayfish and crabs for the food basket. I did manage to spot a hermit in a mature *Charonia tritonis* and a large specimen of *Cypraea tigris*.









TONNIDAE
Tonna perdix **Linnaeus, 1758**
Cook Islands, Aitutaki. Lagoon near Maina Motu,
night snorkel, depth 2m., 31 August 1898.

A night snorkel in the lagoon gave a different view of the marine life. The coral polyps were out filtering, and the big-eyed fish are the night shift. Molluscs such as *Cypraea caputserpentis* and *Cypraea obvelata* leave their daytime hiding places to crawl exposed. The most dramatic sight was an active *Tonna perdix*(figured life size). It was crawling under an overhang questing from side to side with its white-tipped siphon. To negotiate lumps of coral it reared up poised only on the posterior third of the foot. The mottled pattern of creamy brown and white stripes was not symmetrical. The eye spots could be clearly seen at the base of the long tentacles.

Other holiday highlights included a scuba dive to 26m. Outside the reef the giant clams with their glowing blue, green or purple mantles were admired but not collected! Another day when out on the lagoon we did see a pod of hump-backed whales and hurriedly donned snorkel gear but by the time we had scurried across the reef and plunged through the surf the whales had passed by.

The Aitutaki visit was a unique experience because we did not feel like tourists. Not everyone gets to stay up all night to make her own intricate *leis* for the sad farewells next day! The smell of frangipani will always evoke vivid memories of Aitutaki.

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Book review

A FABULOUS NEW OVERVIEW OF AUSTRALIAN PROSOBRANCH GASTROPODS

"Australian marine shells, 1. Prosobranch gastropods, part 1" and "Australian marine shells, 2. Prosobranch gastropods, part 2", by Barry Wilson, with drawings by Carina Wilson and photography by Patrick Baker. Odyssey Publishing, Perth, 1994; 408 pp., 44 pls., and 370 pp., 53 pls. (A$220 for both volumes, or A$115 each; distributed by University of Western Australia Press, Tuart House, Nedlands,WA, 6009).

All professional malacologists, shell collectors, ecologists, and marine biologists interested in the enormously diverse marine molluscan fauna of Australia have made great use of Barry Wilson's earlier book, "Australian shells", since it was first published in 1971. Most will have been disappointed, though, at its relatively limited coverage of only 600 species of those most popular of collectors' favourites, the prosobranch gastropods. Now Barry has published two large, beautifully and lavishly illustrated volumes on Australian gastropods. Although these again include only the prosobranchs, they are covered much more fully than previously, with over 2400 species described and illustrated in the two volumes.

After the usual introduction to molluscs, classification, conservation (covered thoughtfully in the preface as well), curation of collections, and sources of further information, Volume 1 covers the limpets to the tonnoids and other "higher mesogastropods". The coverage of all those groups that hardly ever get a mention in collectors' guides is nothing short of superb. Groups covered very fully are the limpets, neritids, Scissurellidae, Fissurellidae, trochoid families (note the introduction of *Jujubinus* for Australian species, p. 80) , Turbinidae, cerithioids, Littorinidae, Strombidae, Calyptraeoidea, Naticidae, Tonnoidea, Triphoridae, Epitoniidae and Eulimidae. Groups that consist entirely of minute species (such as Skeneidae and the rissooid families) are illustrated with a few examples, with references provided for those looking for further information.

However, the aspect of this volume that will be of the greatest interest for collectors and scientists alike is the treatment of the "cowries", Cypraeoidea and Lamellarioidea. Together these superfamilies occupy 42 pages and 12 plates. This section is not only exhaustive, but also presents valuable new science in evaluating (and synonymising most of) the numerous, biologically meaningless, named colour and geographical forms of *Cypraea (Zoila)* and *C. (Umbilia)* species - five magnificent plates of these, alone!

As in Volume 2, photography is superbly sharp and accurately colourful, with tastefully contrasting coloured backgrounds, and the biological aspect of molluscs is enhanced by the many colour photographs (most by Barry himself) of the strikingly coloured living animals. Many of the smaller species are illustrated with excellent, attractive drawings by Barry's daughter Carina, placed through the text alongside the relevant description. I am particularly delighted to see that Barry has published all my name changes in Ranellidae before I have managed it myself! Other scientifically useful aspects of the book are the deletion of all geographic subspecies in the Ranellidae, and the illustration of

holotypes of several rare species, throughout both volumes. Holotypes are clearly identified as such in the plate captions.

Volume 2 covers the groups formerly known as neogastropods - Muricidae/Buccinidae to Conoidea. Muricidae are covered in detail, again with many of Carina's drawings to illustrate the smaller species. Other groups treated in detail are Turbinellidae, Buccinidae (in which are included Fasciolariinae and Nassariinae), Columbellidae (*excellent* coverage of 63 species), Olividae, Harpidae, the "mitroid" families, Cancellariidae (46 species), Terebridae and Turridae. But again, the great strength of this volume is the very fully covered and beautifully illustrated collectors' favourites, the Volutidae (11 plates) and Conidae (9 plates), in many cases giving a much better idea of variation and colour forms than there is room for with the other families.

I have only two minor disappointments about these books. One is that the plates are collected together at the end of each volume, whereas at such a price I would have thought they could have been placed near the relevant text. The other is that Marginellidae and, in particular, that enormous "family" Turridae are not more fully treated. The sheer exuberant variety of turrids (Baden Powell estimated there are 10 000 named species) implies a niche specialisation and diversity we are only just beginning to comprehend, and it would have been helpful to have had many more colour photographs of Australian taxa. Even though this "family" needs much more attention from taxonomists in Australia, those hundreds of taxa named by Hedley, Iredale and Laseron would have made a useful start on a modern study.

In summary, these books are simply *gorgeous*, as well as accurate and scientifically valuable. They provide the best collection of colour photographs of prosobranch gastropods ever published (but when can we expect something on the rest of the gastropods?). They include quite a number of species that occur also in New Zealand or are closely related to New Zealand species, and a high proportion of the illustrated species will be recognised by collectors and biologists throughout the tropical Indo-West Pacific realm. Australia's endemic, restricted cowries and volutes are covered in the most detail, though, with important new scientific conclusions. Along with Lamprell and Whitehead's "Bivalves of Australia", collectors and students of Australian molluscs now have far better identification guides than almost anywhere else in the world. In my opinion these wonderful books are excellent value at A$220, and should be in the libraries of all serious collectors, of all marine biologists working on the Australian biota and, indeed, of everyone fascinated by the amazing beauty and diversity of molluscs.

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NEW ZEALAND SHELLFISH

How They are Classified

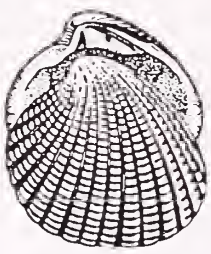
Shellfish are better referred to by their scientific name, *Mollusca*. The difficulty with the popular term *shellfish* is that not all *shellfish* possess a shell and over a third of the known *shellfish* dwell exclusively on dry land.

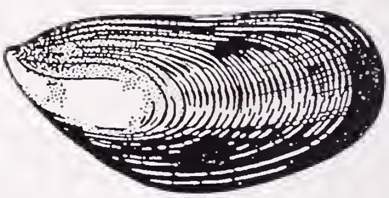
The name mollusc simply means soft-bodied, that is, in the sense that it has no internal skeleton. The animal does not have limbs and jointed armour as in the crab or crayfish(*Crustacea*).

Molluscs are divided into seven great classes, and it is mostly an easy matter to decide to which of the five classes any particular mollusc belongs.

1. Bivalves or (Bivalvia)

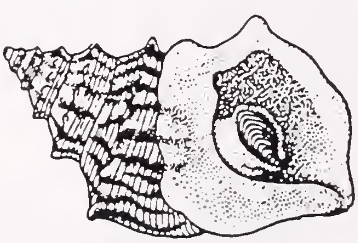
Shell in two pieces, hinged along one edge; mostly both valves are the same (cockles and mussels) or the separate valves may be of different shapes (scallops and oysters). Bivalves live in the sea and in fresh water only; there are no land forms. They feed by means of siphon tubes on minute drifting organisms in the sea (plankton) or on decaying plant and animal substances (detritus), sifted from mud. They breathe by the operation of complicated gills. Feeding and breathing are linked, in that food-laden water is caused to circulate through the animal by the vibrating action of tiny hairs or filaments. Most bivalves burrow out of sight into sand or mud. Some attach or cement their shells to rock(mussels and oysters), other bore into rock or even into timber (teredo or ship-worm). Some scallops swim.

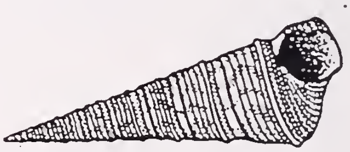




2. Univalves or (Gastropoda)

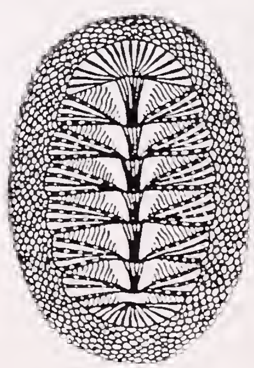
Shell in one piece, usually spirally coiled; or may be a small internal remnant or even absent (slugs). Univalves live in the sea, fresh-water and on dry land. They are either vegetarian or carnivorous feeders. They breathe by means of gills in the case of water forms and by means of a lung in the land snails. Almost all the univalves have jaws and a *radula*. That is a ribbon-shaped process studded with a large number of sharp teeth. The radula lines the bottom of the throat and tears the food into small pieces whilst swallowing takes place. Some univalves use the radula to drill holes through the shells of their victims. The small oyster-borer (*Lepsiella scobina*) drills and devours oysters in this way. Univalves are represented by periwinkles, limpets, whelks, snails and slugs.





3. Chitons (Polyplacophora)

Shell in eight pieces, held together by a surrounding oval leathery girdle; the girdle often studded with scales or hairs. Chitons live on and under stones and exclusively in the sea. They are all herbivorous, feeding directly upon seaweeds. They breathe by means of gills and feed with a radula similar to that of the univalves.

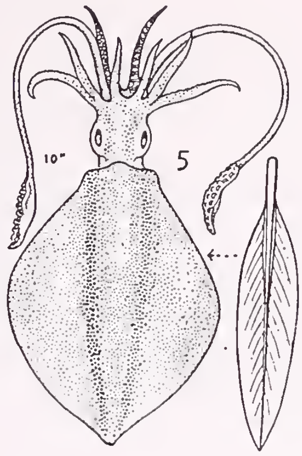


4. Tusk-shells (Scaphopoda)

Shell in one piece, a tapered tube, open at both ends. They live buried in mud on the sea-floor and feed on small organisms sifted from the sea-water. Since they are from deep water, tusk shells seldom wash ashore on beaches.

5. Octopus and Squid (Cephalopoda)

Shell present or absent, spirally coiled or as an internal remnant of simple shape. The animal has eight or ten arms, bearing suckers. They live only in the sea, are very active and feed on other shellfish, crabs and even fish. They have gills and a radula. The octopus has a round body, eight arms and no shell. The squid has ten arms, a long body and an internal shell-remnant. The Paper Nautilus is produced by the female only and is used to house the eggs.

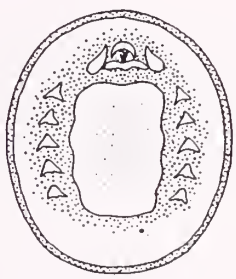


Worm Like Molluscs (Aplacophora)

Mostly very small, covered with calcereous spicules. They live in the sea at great depths.

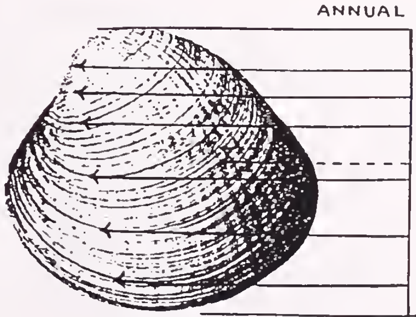
Limpet Like Molluscs (Monoplacophora)

These molluscs have internal segmentation and a thin almost circular caplike shell. About 10 species of these rare "living fossils" are known, all from deep water.



The Life Span of a Shellfish

The Huangi (*Austrovenus stutchburyi*)[1] and many other bivalves register their age upon their own shells by means of winter rest stages in shell growth, shown by the prominent rings. Note the last stage, which is only half of the preceding one, showing that the shellfish was gathered in mid-summer. The weaker irregular rings have been caused by disturbances e.g. storm, and the fine regular ones are normal growth lines.The yearly growth stages can be traced in many spiral univalves also.



Acknowledgements: Auckland Institute and Museum, A.W.B. Powell, Compedium of Shells, R. Tucker Abbott and S. Peter Dance 1982.

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[1] The word *tuangi* is ambiguous referring to both *Austrovenus stutchburyi* and *Protothaca crassicosta*. *Huangi* would appear to refer unambiguously to *Austrovenus stutchburyi* and *karoro* to *Protothaca crassicosta*.

Larochea miranda Incubates its Young

by Margaret S. Morley

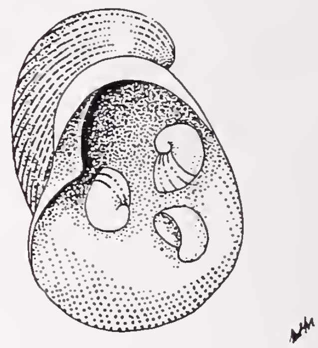
In October 1994 the Marine Department of the Auckland Institute and Museum was doing a dredge survey of marine organisms in the Bay of Islands.

Nancy Smith and I were both sorting fine dredged material taken on this survey at a station 500m SE of Motuarohia at a depth of 7m. When we compared check lists, Nancy had identified some microscopic specimens, transparent white and delicately textured with axials and spirals, as *Larochea miranda*, height 0.6mm, width 1.2mm. I had seen some of this species in the material I was sorting, but had passed them over thinking them to be a juvenile *Scissurella*, before a slit developed. A more careful second look at these was needed to confirm her identification. To do this, I was coaxing some shell grit out of the aperture to see the shelf-like excavation clearly. Suddenly I realised that the shell grit was not grit at all, but several juveniles of *Larochea miranda*!

Some filmy remains showed that the adult was alive when dredged indicating that this species incubates its young. Powell (1979), says the position of *Larochea miranda* in the family Lamellariidae is provisional, because the animal is unknown.

Bibliography:
Powell, A.W.B. 1979, New Zealand Mollusca; 151

Lamellariidae, *Larochea miranda* Finlay 1927
Height, 0.6mm, Width 1.2mm



POIRIERIA TWENTY YEARS AGO

Steve O'Neill reported that he dredged *Cypraea cernia tomlini and Morula palmeri* from 25 fathoms at Deep Water Cove and that a skin diver took live *Conus kermadecensis* (plural) in the vicinity of Whangaroa Heads.

Plenty of *Nassarius spiratus* were being seen in the north and came to the feast when pieces of sea egg were put down.

Damaris Hole described the very lovely nudibranch that she found at Matai Bay in "an entirely pelargic washup of great beauty". This was *Glaucus atlanticus* (Forster,1777) which feeds on Vellela and Portugese Man-of-War and is rarely seen in N.Z.

N.G.(Now which one of the Gardners would that be?) described the *Herpetopoma* species with nice big drawings to help distinguish one from the other.

There are some land snail locality lists, a description with drawings of *Cleidothaerus maorianus* Finlay,1926 and a very interesting description of the goings on in her sea water aquarium by L.Witterick.

Some back numbers of these interesting old "Poirierias " are available from Nancy Smith or Mrs M.Town.

WHAT TYPE OF *TYPE* ??

Hugh R. Grenfell, Marine Department, Auckland Institute & Museum

ALLOTYPE: Paratype of the sex opposite to that of the holotype.

AUTOTYPE: A specimen of the type species identified by the original author. Not necessarily from the type locality.

COTYPE: The term is recommended for rejection by the International Commision on Zoological Nomenclature because of its similarity to and/or confusion with paratype and syntype. Previously used for an additional type specimen, frequently collected in the same place and at the same time, as the type. Or a specimen from whose description, along with others, the type is defined.

GENOTYPE: The type species. In genetics, the genetic constitution of an organism or a species in contrast to its observable physical characteristics.

HAPANTOTYPE: A suite of preparations of directly related individuals representing differing stages of the life cycle.

HOLOTYPE: The single specimen chosen for the designation of a new species.

HYPOTYPE: Any specimen described or figured in order to amplify or correct the identification of a species.

ICONOTYPE: A representation, drawing or photograph of a type.

ISOTYPE: A specimen collected from the same plant as the holotype and at the same time; type of plant or animal common to two or more regions or areas.

ISOLECTOTYPE: Specimen which is a duplicate of the lectotype.

ISONEOTYPE: Specimen which is a duplicate of the neotype.

ISOSYNTYPE: Specimen which is a duplicate of the syntype but which has not been seen by the original author.

KLEPTOTYPE: A stolen piece of the holotype! (Applies most commonly to botanical specimens).

LECTOTYPE: A specimen chosen from syntypes to serve as the nomenclatural type when all original material is missing.

MONOTYPE: A holotype by virtue of being the only specimen cited by the original author (Fosberg 1993, p.42).

NEOTYPE: A new type; a new holotype; a new type specimen from the original type locality.

PARATYPE: Specimen described at the same time as the type of a new species.

PARALECTOTYPE: A specimen, of a series used to designate a species, which is later designated as a paratype.

PLASTOTYPE: A cast (e.g. plaster) or three dimensional replica of the holotype.

PLESIOTYPE: A species related to the genotype found in a different region or geological formation.

SYNTYPE: Any one specimen of a series used to designate a species when the holotype and paratype have not been selected or specified.

TOPOTYPE: A specimen from the original locality of the type.

References: Bates, R.L. & Jackson, J.A. 1980: Glossary of Geology (2nd edition)

Fosberg, F.R. 1993: The Forster Pacific Islands collections from Captain Cook's Resolution Voyage. *Allertonia* 7(2): 41-86.

Henderson, I.F & Henderson, W.D. 1963: "A dictionary of biological terms."

ICZN 1985: International Code of Zoological Nomenclature.

IN PRAISE OF MUSTARD YELLOW

by M.S. Morley

The bed of kelp dances in chorus to the rhythm of the swirling water. Each frond in unique tones of mustard yellow,yet in harmony with the whole. Now a segment glows translucent gold as the sunlight lends its energy. Now the colour darkens towards bronze as a shadow ripples across. The surface of the fronds are papillate, the ribbon edges sinuous and the long strands definitely chewed at the tips. Each strives upwards competing for its vital photosynthesis.

At night Kina climb up the stems with the suction of their tube feet, to grind their meal of kelp. Opal Top Shells also graze on the kelp, securely velcroed against the swell by muscular feet. A bryozoan captures passing plankton and spreads across older fronds netting them in white. Anenomes cling along the fronds and some fall prey to a sea slug *Baeolidia australis* blending with the kelp stem. This rarely seen beauty is resplendent in mustard yellow, kelp yellow.

The bed of kelp is home to silvery shoals of young fish needing shelter from predators. Mature Red Moki glide between the fronds. Metres below, the holdfasts clasp the algae securely to the sea floor with sombre brown divided fingers. Even the holdfast itself offers a protective niche for sponged, bristle worms, hermit crabs and micro molluscs.

Should a violent storm avulse the holdfast the whole is cast ashore. The mustard yellow loses its vibrancy and decomposes to a dark, slimy ochre brown. But at the high tidal zone many metallic blue molluscs await just such strands of food so it is still appreciated.

Yes, mustard yellow is hot stuff!

Publications:

DE CARTERET, N.

1994 A sheller's paradise, Naigani Island, Fiji. *Hawaiian Shell News* 42(3): 5–6.

1994 The genus Oliva from Mele Bay, Vanuatu. *World Shells* 8: 40–42.

1994 Sand dwelling cones from Mele Bay, Vanuatu. *World Shells* 9: 52–54.

1994 Rarities continue to come from the Solomon Islands. *World Shells* 10: 70 - 71

NEW IN THE LIBRARY

by RAE SNEDDON

We have had several acquisitions to the library this past year, including two major publications.

We have been very pleased to finally receive the two volumes of *Australian Marine Shells: Prosobranch Gastropods*, by Barry Wilson. These I have used extensively over the past few weeks and have found them very useful. The plates of illustrations are good, either on a black or a blue background, and the descriptions in the text include many with drawings of shells not illustrated in the plates. It is not complete. Families not represented are Architectonicidae, Bullidae, Melampidae, Siphonariidae and some of the smaller families, but on the whole this is a very good and up-to-date book on Australian gastropods.

The second major publication we have recently received is *A Guide to Worldwide Cowries* by Felix Lorenz Jr. and Alex Hubert. This is a monumental work, including text, plates and tables. The descriptions include line drawings to show features and variations, plus maps with the range. The plates are excellent and show many examples of one shell with its variations. There are beautiful photos of some of the living animals and sketches too of fossil cowries. This is an excellent book for the cowrie enthusiast.

Two other books recently acquired are *Ranellidae and Personidae* by Thomas Henning and Jens Hemmen, and *Taxonomic Revision of the Family Psammobiidae(Bivalvia: Tellinoidea) in the Australian and New Zealand Region* by our own Richard Willan, now curator of the Northern Territory Museum in Darwin. The book on Ranellidae has very clear drawings of each shell in a series of plates with good data and descriptions in the text. It also has a comprehensive bibliography.

Richard Willan's book on the Psammobiidae is a publication from the Australian Museum, and includes full descriptions and a clear set of black and white photos of each species with line drawings showing hinges and pallial lines.

We have also received several recent scientific papers. Theses include one by F. M. Climo and J. F. Goulstone on New Zealand landsnails, several papers by B. A. Marshall, and three by Mike Eagle and Bruce Hayward. There are also four articles by Nick de Carteret photocopied from recent periodicals, and several by Mike Hart printed in the lovely Italian periodical " World Shells".

SEBASTIAN — THE SNAIL

I have long sought — how often have I sought him,
The sturdy robber in his coat of mail;
And now this thund'rous nightfall I have caught him,
Sebastian the Snail.

Yes, here I hold him fast, my ancient foeman,
Of portly presence, stout and round and strong;
Like Falstaff, shamming dead, Sebastian? No man
Shall save thy life for long.

Bring me the brine-pot, I will see him drinking
The deadly draught; Sebastian shall die.
And yet — what memories have set me thinking
And rather wond'ring why?

Who knows what cruel wrong has been inflicted,
What ills have rankled in that horrid head,
What dream of haunts from which he was evicted,
What kindred loved and dead?

'Twas here I found two snails one morning sitting
Upon one tulip leaf. My wrath arose,
And I so dealt with them as I saw fitting.
His wife, his child — who knows?

Be that as may be, there is this about him,
He has provided sport for many hours,
And this bed here will be quite dull without him,
Though it be decked with flowers.

Pursued by me, fair game for ev'ry starling,
He still escaped, a snail of many wiles[1],
Ulysses-like, Autolycus's darling[2],
To eat my plants in piles.

He ate schizanthus, and I sought at night time,
At nine o'clock; he got to work at ten.
I went at ten but that was not the right time;
He chose eleven then.

I tried eleven, for my annual phlox were
Nibbled away as level as a lawn;
He sought the spot where my most cherished stocks were
And breakfasted at dawn.

When he attacked my antirrhinums (twenty
Fell between eleven and the break of day)
And I laid poison thick and slab and plenty,
He went another way.

Knowing each trick, each trap for the unwary,
Skilled to anticipate and to detect,
Cautious and scheming, calculating, chary,
He won my deep respect.

A gallant fellow; no, I will not slay thee,
Sebastian, but thou needs must change abode;
Hence to the Elba where I gently lay thee,
The ditch across the road.

Farewell. If in requital of my mercy
Thou walk'st back here, round and fat,
I shall not know thee. I shall call thee Percy;
And Percies I squash flat.

Author unknown

[1] "Of many wiles" has become established as the standard translation of the much cited epithet *πολύτροπος* of Odysseus, called Ulysses in Latin, who was renouned for his cunning. Homer, *Ὀδυσσεῖα*, Book I, Line 1.

[2] Autolycus, grandfather of Odysseus, was renouned as a cunning thief. Hermes, whom he claimed to be his father, had granted him the power to metamorphose the animals, which he stole, thus making the detection of his crimes extremely difficult.

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Conchology Section

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CONTENTS

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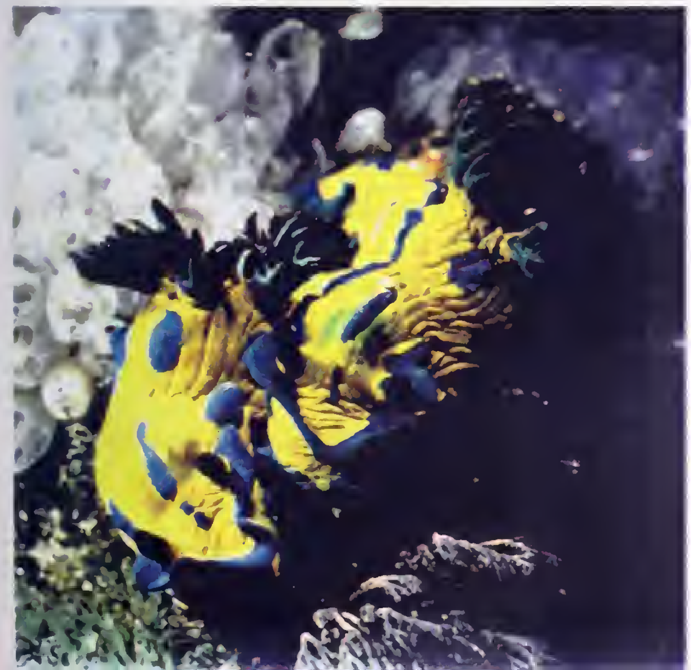


A Small Point - Features of the Protoconchs of *Cymatium parthenopeum parthenopeum* (Salis, 1793) and *Cabestana spengleri* (Perry, 1811): Ranellidae

by Margaret S. Morley

Cymatium parthenopeum parthenopeum (Salis, 1793)
= *Monoplex parthenopeus* in Powell, 1979

On 19th December 1986 I collected shell sand from the high tide line at Medlands Beach, east coast of Great Barrier Island. When the material was sorted under the microscope a tiny unusual shell was found (Fig. 1).

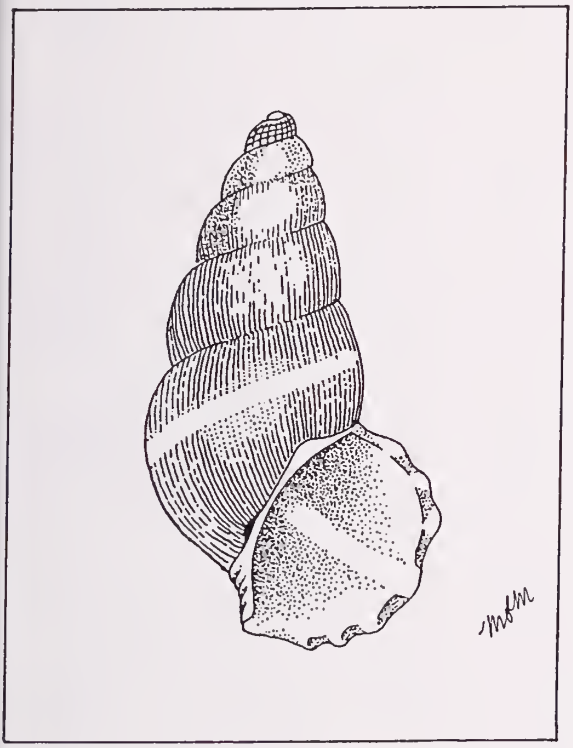

Fig. 1 Protoconch of *Cymatium parthenopeum parthenopeum* 19th Dec. 1986, Medlands Beach in shell sand. Height 4mm, Width 2mm.

Description

It measures 4mm in height. The 5½ spire whorls are transparent, golden-brown, fading to pale honey on the outer lip. A peripheral white band is present on the last whorl. There is a narrow umbilicus. The outer lip of the aperture is greatly expanded and thickened with sinuous projections.

I was unable to identify it but was sure it had to be rare! Dr Richard Willan examined it and tentatively suggested it was the protoconch of *Cymatium parthenopeum parthenopeum*.

Over several years I checked many adult specimens but when examined microscopically none had the protoconch intact. Then on 4th April 1991 I found a juvenile specimen 30.8mm in height which had gently washed in at muddy Orua Bay on the Manukau Harbour. A perfect protoconch plus the adult whorls confirmed Richard's identification (Fig. 2).

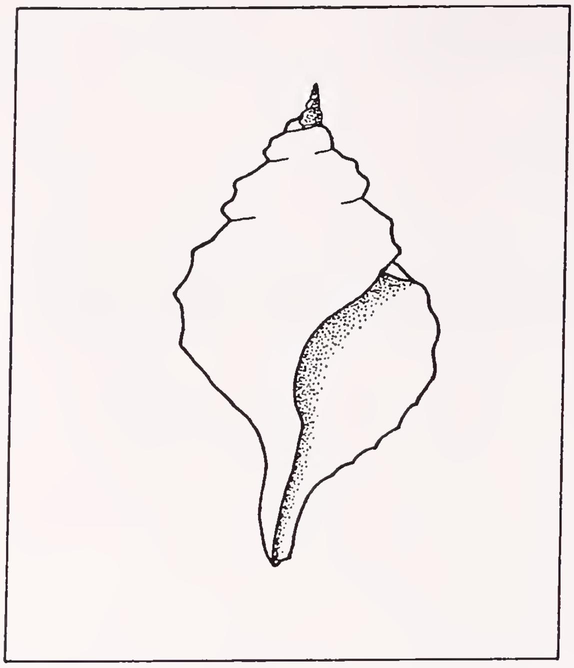

Fig. 2 Diagram to show relationship of protoconch to adult whorls in *Cymatium parthenopeum parthenopeum*. Height 30.8mm

Surface Sculpture

Suter (1913) describes the protoconch of *C. parthenopeum parthenopeum* as attenuately conical, corneous of six microscopically reticulate whorls separated from the succeeding adult whorls by a slight varix. However, Powell(1979) says that the protoconch of *C. parthenopeum parthenopeum* is tall narrow and smooth of about five whorl enveloped in a brownish horny envelope.

***C.parthenopeum parthenopeum* Specimens Examined** (AK no. = Auckland Museum collection)

1) Protoconch only. Author's collection, Medlands, Great Barrier Island 29th November 1990. The shell is translucent glossy with very fine, regular growth lines noticeable on the last two whorls. Reticulation is present on the whorl after the tip.

2) Protoconch only. Author's collection, Waihau Bay, East Cape, wash-up in shell sand. Sculpture similar to 1 with the addition of crazing within the shell substance on the last two whorls.

3) Protoconch and one adult whorl, off Mt. Maunganui. *Ex pisce*. William's Collection, AK 98722. Three specimens.

Specimen A, height 8mm. It has very fine axial striations that are diagonal rather than vertical.

Specimen B, height 12.4mm. Similar texture to specimen 1 but the whorl following the minute tip is clearly reticulated.

Specimen C, height 15mm. Similar diagonal striations but no reticulation.

4) Protoconch plus adult whorls, height 16mm. AK 33923, Hauraki Gulf. The tip of the protoconch is missing. the remaining protoconch whorls are smooth.

5) Protoconch and adult whorls. Height 30.8mm. Author's collection, Orua Bay, Manukau Harbour (Fig. 2). The protoconch whorls are smooth except for fine axial ridges near the sutures. The impression is that the horny outer layer has shrunk after drying.

6) Protoconch and adult whorls. Height 30mm. Opotiki, Bay of Plenty. W. La Roche Collection, AK 98718. Faint growth lines within the shell substance on the last whorl of the protoconch. Otherwise smooth.

7) Protoconch and adult whorls. Te Kaha, East Cape. AK 98719. The squat proportions of this specimen are atypical. There is some fine reticulation on the whorl after the tip.

8) Protoconch and adult whorls. Whitianga, Coromandel. Depth 32m. Found inside a living scallop (*Pecten novaezelandiae*). Collected by N. F. Thomas, 27th January 1973.

Specimen A, height 23.7mm. Protoconch smooth except for an occasional growth mark in the shell substance.

Specimen B, height 18.2mm. The protoconch has some diagonal striations on the last whorl otherwise smooth.

Both specimens have an operculum.

Conclusion

The protoconchs of the specimens examined have a range of texture from smooth to fine striations with or without reticulation indicating that this is a variable feature.

Endnote

It is interesting to note that the embryonic stage of *Cymatium parthenopeum* in the plankton lasts up to three months (Henning & Hemmen 1993). Do the veligers then need to find and settle in a scallop in order to develop into the adult shell? Are they parasitic at this stage, feeding on the scallop tissues or are they commensual? Certainly *Cymatium parthenopeum* in my aquarium show a strong preference for scallop and will capture one within minutes of its being introduced.

The long planktonic stage accounts for the wide distribution of *Cymatium parthenopeum*. It occurs in the Mediterranean, the South Atlantic islands, South Africa, Bermuda to Rio de Janeiro, Australia, Lord Howe and New Zealand including the Kermadecs.

Cabestana spengleri **(Perry, 1811)**

In the spring *Cabestana spengleri* lays egg capsules (Figs. 3 and 4). These have been observed at Laingholm in the Manukau Harbour on the low tidal rock platform by Damaris Hole during August 1969, and myself on 10th September 1987. The *Cabestana spengleri* adult is firmly attached to the egg capsule which is strong and flexible.

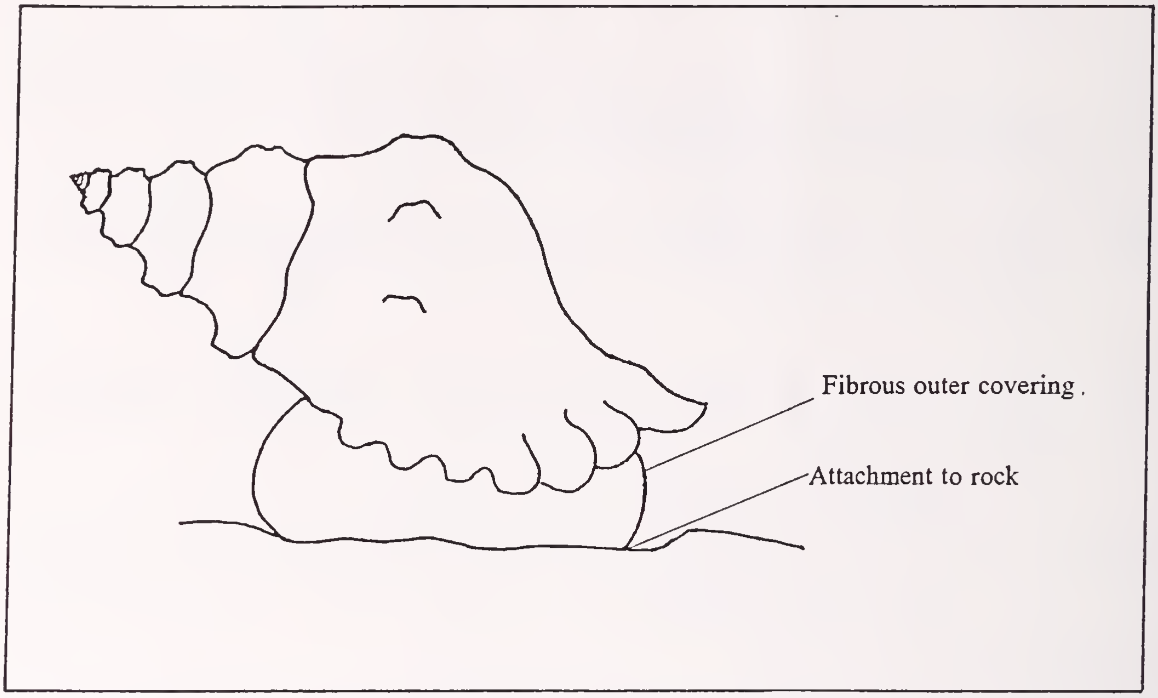

Fig. 3 Diagrammatic outline of *Cabestana spengleri* sitting on an egg case.

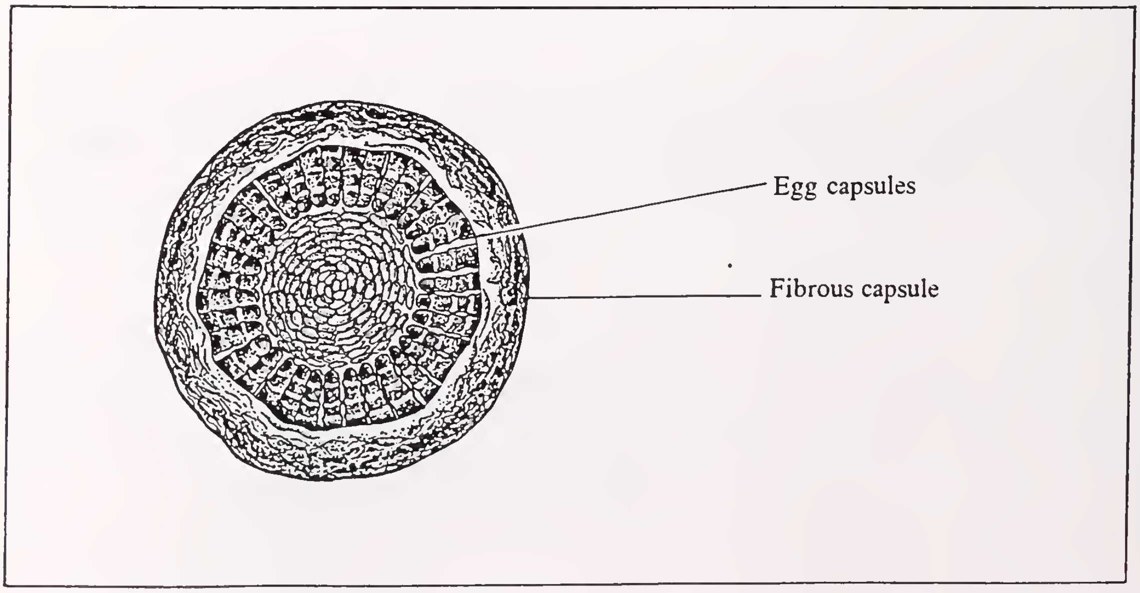

Fig. 4 Egg capsule of *Cabestana spengleri* from above. Drawn actual size.

The Protoconch

Suter (1913) describes the protoconch of *Cabestana spengleri* as 4½ horny translucent and very finely reticulated whorls, slightly oblique to the vertical axis. Powell (1979) confirms this, but it is not clear whether he is summarizing Suter's description or examined further specimens himself. It is unfortunate that protoconchs do not have types for comparison.

Cabestana spengleri **Specimens Examined**

1) Protoconch and adult whorls, height 8.2 mm. Author's collection. Dredged in fine sandy mud at a depth of 16m off Motuarohia, Bay of Islands, October 1994 (Fig. 5). The protoconch has 4½ horny translucent smooth whorls, golden tan in colour. Although not taken alive the texture on the adult whorls is sharp and shows no sign of abrasion.

2) Protoconch and adult whorls. Orua Bay in the Manukau Harbour, the Rev. Webster Collection, AK 98857. The protoconch has four whorls. There is fine reticulation on the first whorl, fine growth lines on whorls two, three and four. The fourth whorl also has fine nodules in four spiral lines.

3) Protoconchs and adult whorls. *Cabestana spengleri* (boltoniana form). Reef Point, Ahipara. 6th April 1967. AK 15081.

Specimen A, height 34mm. Growth striations on whorls two and three of the protoconch.

Specimen B, height 36mm. The protoconch has growth striations on the last two whorls.

Specimen C, height 32mm. The tip and second whorls of the protoconch are smooth. There are diagonal striations and also pustules in spiral lines on the last whorl. These are possibly initial attachments for the periostracum.

I have not found a protoconch of *Cabestana spengleri* without adult whorls.

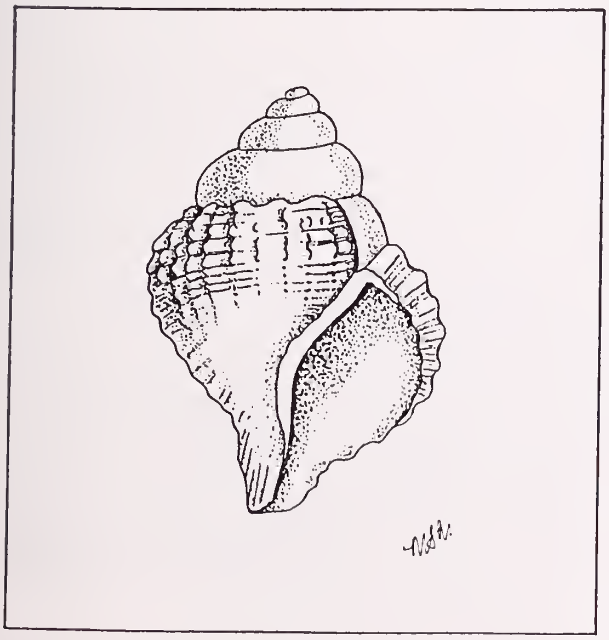

Fig. 5 *Cabestana spengleri* protoconch and first adult whorl.
Height 8.2mm,

Conclusion

The protoconchs of *Cabestana spengleri* examined show variation from a smooth to a textured surface.

Acknowledgments

I thank Bruce Hayward for reviewing the manuscript and for permission to examine specimens in the Auckland Museum collections; Damaris Hole for her collection information; the late Bob Penniket for sharing his observations at Conchology Section meetings in the 1980's and Glenys Stace and Frank Boulton for typing the manuscript.

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POIRIERIA TWENTY YEARS AGO from Nancy Smith

There is no mention of the weather or the sea temperatures, but our waters were sheltering quite a few molluscs from warmer climes. *Morula chaidea* was becoming "established in the far north and "Some of our members report seeing dozens in certain rocky areas." No Names or places except for "--- Mr H.C.Seeley picked up a live, half grown specimen at Merita, Doubtless Bay---". I wonder if there are any extant today?

G.Henderson was finding and studying *Nassarius spiratus* at Bland Bay. They were very juvenile at Xmas, but had grown at Easter with one starting to develope a thickened lip. Fish baits brought them up out of the sand where they returned after a few minutes feeding.

A live *Conus* was found on sand at 80 feet on the south western side of White Island by Mr J.H.Seddon. Another diver found a dead cone shell and an *Ellatrivia marmorata* shell. Unfortunately the cone was not named although the animal was described as "---yellow with dark brown spots, like a leopard, each spot having a lighter centre." Another report says that several Whangarei divers were keeping this cone in tanks and feeding it on garden earthworms!

The rarest of all were the live *Cypraea erosa* Lin. found by T.Hook in Whangarei Harbour! But don't go searching because Mr Hook explained that the Cowries had travelled in the thruster case of an oil rig, "Penrod 74" where the temperature can run at about 70 degrees. Mr Hook knew to look out for these animals as he had previously found Live *Cypraea caputserpentis* Linn. in a rig off the Taranaki Coast. He was unable to explain how those specimens came to be there. Samples of both cowries were sent in for inspection and were "in first-class condition, of average size and with a very high gloss." Both species were very dark in colour.

CONILITHES WOLLASTONI, Maxwell and CONE SHELLS in NZ.

by Ron Adams

CLASS: Gastropoda
SUPERFAMILY: Conoidea
FAMILY: Conidae
SUB-FAMILY: Coninae

CONES TODAY: There is little doubt that members of Sub Family Coninae are alive and well in New Zealand waters today and though their distribution around the northern North Island (fig.1) would seem to support the idea that they could be part of a wave of recent migrants, as planktic larvae via the East Australian current (1976 Symposium Poirieria Bull), there is also little reason not to believe that the deeper water cones have been long-time residents before being discovered. The largest living specimen still seems to be 74mm in length (see 1972 Parengarenga find). Records of local (Wanganella Bank and Silent 1 Seamount have been included due to their more southern latitude) inhabitants which I can locate include:

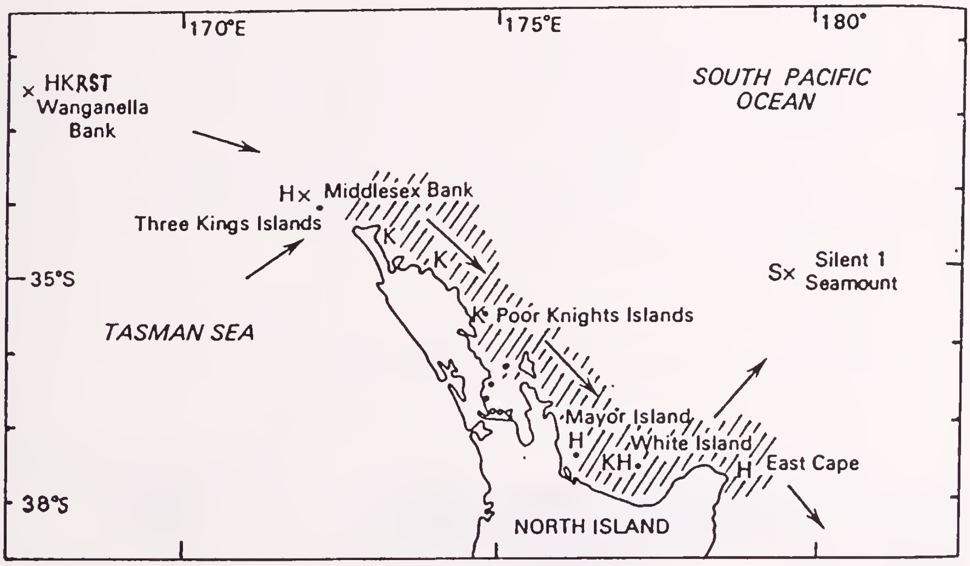


FIG 1 North Island East Coast distribution of living Coninae (shaded). (After Marshall 1981)
K = *C. lischkeanus kermadecensis*; H = *C. howelli*.
R = *C. raoulensis*; S = *C. smirna*; T = *C. teramachii*.

Conus lischkeanus kermadecensis

Parengarenga Har. ELT sandbank, Jan 72 Mrs Armiger (Powell 1979)

Poor Knights Is, skin diving, Mar 1972 Andrew Wilson (Poirieria 7(6); Powell 1979)

Stephenson's Island, entrance to Whangaroa Har. 10m, Mr W H Palmer, newspaper cutting Jan 1975. H & M Seelye, pers comm.

Parengarenga Har. ELT Zostera flats, 1982, 3 specimens. H & M Seelye, pers comm.

West side of Little Barrier Is, Scallop dredge, H & M Seelye, pers comm.

Parengarenga Har. 1986 Margaret Morely, via Nancy Smith pers comm.

North Is. east coast deep water south to White Is. (Marshall 1981)

Conus raoulensis

North of Three Kings Is, 440 fathoms Crozier 1966 (poorly preserved, probably *C. howelli* - Marshall 1981)
Wanganella Bank (Marshall 1981).

Conus flavidus

White Is. scuba, 1983 claim H & M Seelye, pers comm.

Conus howelli

North Is. east coast in deep water as far as East Cape, 29 specimens (Marshall 1981).

Conus smirna

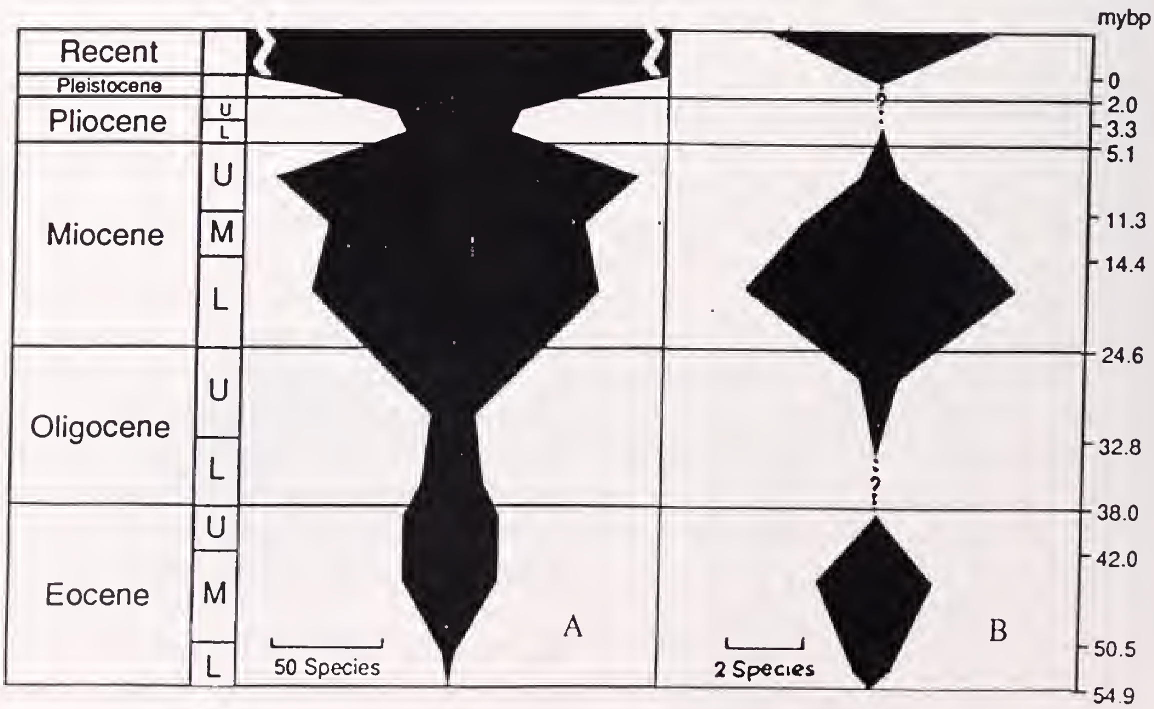
Wanganella Bank, Silent 1 Seamount (Marshall 1981)

Conus teramachii

Wanganella Bank (Marshall 1981)

CONES YESTERDAY: Six living species, you ask, I've not found one! Fig 2 shows that Coninae were represented in NZ during the warmer Eocene and Miocene times in perhaps even greater diversity than now. There is no fossil evidence however that any survived in NZ during the intervening cooler Pleistocene, though some may have. The New Zealand kite diagram (fig 2) of *Conus* species distribution through time reflects remarkably similar evolutionary trends to the worldwide distribution kite. Cone shells are a geologically youthful group not known before Eocene times (Kohn 1990).

FIG 2 Numbers of species of Coninae through geological time.
A = worldwide (Kohn 1990)
B = N.Z. (data, Beu et al 1990)



The furtherest south that fossil cone shells (fig 3) have been recorded in New Zealand is from Southland itself, but since only a few *Conus* inhabit cooler waters today (to just south of Lat.37S: East Cape, NZ; Victoria, Australia), and are more characteristic of tropical or subtropical waters, their presence in southern New Zealand is evidence that Eocene and Miocene water temperatures were probably at least six degrees (the summer difference between East Cape and Southland today) warmer than at present. Cooler Oligocene temperatures in New Zealand (Hornibrook 1992) probably explain reduced cone diversity then (fig 2).

Beu et al (1990) list New Zealand fossil Coninae under the genera *Conilithes* (7spp) and *Conus* (8spp). *Conilithes wollastoni* (fig 344) was studied from Southburn Sand Formation, White Rock River near Timaru to check the Late Lower Miocene environment that it lived in and its shell features, and it was found that the rocks and fossils, which *C. wollastoni* is associated with, indicate it was deposited nearshore. Other deeper (mid-outer shelf) examples are also known (Beu et al 1990).

FIG 3 Examples of New Zealand fossil Coninae, esp.
O.U. Geol. Dept. Centre = *C. trigonus.*
Two right hand specimens = *C. wollastoni.* 1x

CONE VENOM: Maxwell (1978) describes how *C. wollastoni* has preyed on the minds of taxonomists over the past 105 years, injecting several notable paleontologists and conchologists with a venom for confusion regarding its identity (fig 4). Charles Traill collected the original North Otago specimens which Hutton named in 1873.

Suter (1917) considered Hutton's two species (*Conus ornatus* = *Conilithes wollastoni* and *Conus trailli* = *Conus huttoni* to be the same "on the basis of the variation in strength of the peripheral nodules". Maxwell (1978) reinstated the two species, not on the basis of peripheral nodules or size (He believed that both of Hutton's species fell into the same range for each of these features) but on *C. trailli* "having distinct spiral grooves over the whole of the last whorl". This splitting on the basis of spiral grooving has resulted in these otherwise very similar cone shells now being placed in two separate genera! It must be acknowledged that *C. huttoni* is known from only one incomplete specimen. The originator of the genus *Conilithes* was Swainson (1840).

Walter Cernohorsky (1978), writing at the same time as Maxwell, states: "since no logical and scientifically valid generic and sub generic classifications (of Coninae) have yet been attempted, all species are here retained in the single genus *Conus*." In addition, "Most 20th century authors include in the Coninae only *Conus* (and perhaps *Hemiconus*)" (Kohn 1990). So it has probably been premature of New Zealand scientists to maintain this generic split for now, especially on the slim evidence available. Measurements of White Rock River specimens alone show that there is variation in peripheral nodules, spiral grooves, spire height and gross shell proportions to include descriptions of *Conilithes wollastoni*, *C. oliveri* and *Conus huttoni*.

The number of different New Zealand cone genera and species one could expect to collect as fossils or as living organisms will be further clarified one day (here's a job for someone), especially as studies in fossil morphology enable more reliable resolution into individual species, which ideally should bear a corresponding degree of variation from each other as do extant species.

Acknowledgements: My sincere thanks to Ewan Fordyce (Otago Univ. Geology), Phillip Maxwell, Bruce Marshall and member Andrew Grebneff for reading this essay and offering many helpful comments; also to Mike Eagle, Nancy Smith and others.

FIG 4 Chequered taxonomic history of *C. wollastoni*.

1873 Conus ornatus, Hutton — Conus trailli, Hutton

Conus (Conospira) ornatus, Suter — Conus huttoni, Tate

Hemiconus trailli, Suter

Conus ornatus, Suter

Conus trailli, Finlay

Conospira (mis spelt Cenospira) bimutata, Finlay

Conospirus bimutata, Marwick

Conilithes bimutata, Fleming

(= Conilithes huttoni or Conospirus huttoni)

Maxwell — Maxwell

1978 Conilithes wollastoni, Maxwell — Conus huttoni, Tate

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PERIODICALS:- from Nancy Smith

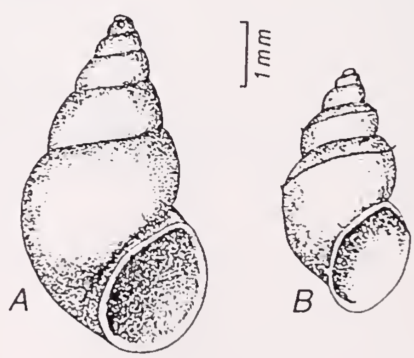
Gloria Maris Vol. 33 part 5
Alphabetical review treating the (sub)species from *Conus sertacinctus* up to *Conus zebra* by A. Delsaerdt.
Illustrated, with clear photographs, some in colour and including a colour plate of 10 species of *Columbellidae* and another of 12 species of *Nassariidae* - 10 *Bullia, Buccinanops moniliferum* and *Dorsanum miran.*
Gloria Maris Vol.33 part 6, 1994. has articles on *Scalptia articularoides,* the Recent *Stomatellidae*, two new species of *Fusinidae* from Somalia and new names for *Natica Fane*l and *Natica multipunctata.*
Vol.34 on the shells of the coast of Belgium is all in Flemish but the usual excellent photographic illustrations are all in colour and *Trivia monacha* (Da Costa,1778) or *Crassostrea gigas* (Thunberg,1793) read the same in any language.
Archiv fur Molluskenkunde from the German Nature Research Society has most of the papers translated into English.This Volume (124) has a redefinition of the genus *Rupacilla;* a new genus for some of the *Gibbula* species; *Cerithium isselii;* and articles on Pulmonata of Pakistan, Turkey, Croatia, the Iberian Peninsula and Argentina.This last is not translated and nor is a paper on the "the aquatic mollusca of the Landschnecken-Kalk [limestone with land snails] in the Mainz Basin.
THE NAUTILUS vol.108 no.2 March 1995, leads off with a A Review of the New Zealand Recent Species of *Poirieria* Jousseaume, 1880 (Mollusca: Gastropoda: Muricidae) with Description of a New Species by Bruce A. Marshall and Roland Houart.
Poirieria syrinx Marshall and Houart,1995, *Poirieria zelandica* (Quoy and Gaimard,1833) and *Poirieria kopua* Dell,1956 are illustrated with line drawings, photographs and distribution maps. In further articles R.N.Kilburn introduces a new species in the *Mitridae*, James H.McLean raises 4 new genera of prosobranch gastropods in the northeastern Pacific, Donn L. Tippett and John K. Tucker discuss the taxonomy of *Kenyonia* Brazier and *Conopleura* Hinds, and *Melampus bidentatus* Say is discussed in a study undertaken in Connecticut. **Nautilus** Vol.108 no3 has two tropical West African species of *Epitonium*, a new *Phalium* from the Indian Ocean and a new *Alvinia* from Southern Brazil. **Nautilus** Vol.108 no4 has arrived and is the eagerly awaited paper by Bruce A.Marshall A Revision of the Recent Calliostoma Species of New Zealand (Mollusca: Gastropoda: Trochoidea)
33 Calliostomatids are recorded, ten of them new. There is some name changing and synonymising. Illustrated with clear photography and distribution maps.
Basteria Vol.58, No.3-4, is a special extra issue on the occassion of the sixtieth anniversary of the Netherlands Malacological Society (1934-1994).It is the beautifully illustrated paper by Dr. J.J.Vermeulen on the second part of Notes on the non-marine molluscs of the Island of Borneo.
Part 5-6 has 10 articles on mostly small species , both land and marine, from round the world, and includes a new record of the rare fossil gastropod *Spiricella unguiculus* Rang,1827; and a new name for *Turbonilla pusilla.*

AN UNUSUAL RANGE EXTENSION FOR POTAMOPYRGUS ANTIPODARUM (GRAY, 1843)

By Walter O. Cernohorsky

Powell (1979) in his treatment of the hydrobiid Potamopyrgus antipodarum (Gray,1843) considered the species to be confined to New Zealand and southern and eastern Australia. He did mention, however, that the species "jenkinsi" (Smith), which was common in England and Europe, was thought to have been accidentally introduced to Europe in the late 19th century.

In a recent article by Cejka (1995), and kindly brought to my attention by L.Kolouch, Hradec Kralove, the author reviewed the reported occurences of P.antipodarum in Great Britain and continental Europe. He mentions the introduction of the species to Great Britain through maritime transport towards the end of the 19th century. Collections of the hydrobiid species from the lower regions of the Thames river were reported upon by E.A. Smith in 1889. The species' next recorded appearance was in Denmark in 1915, and from then on P.antipodarum quickly spread to salt and freshwater regions of western Europe. In 1933 the species appeared in Poland and in 1978 a whole population was discovered in lake Balaton, Hungary. The last report of a record of the species the author Cejka was able to trace was the one by P.Kuchar (ŽIVA, 1/1983), who documented the species' massive appearance in 1981 in the artificially created lake Drinov near Komorany, in the Mostec district of Bohemia, Czech Republic. In this particular case, water birds were credited with the species' range extension. The recent findings of P.antipodarum in the Danube section of the Slovak Republic by Cejka may be due to boat transport on the Danube-Main-Rhine river canals.



Potamopyrgus antipodarum (Gray)
A: typical form B: forma aculeata Overton [Drawn by Cejka after Piechocky]

P.antipodarum in Europe usually first appeared in coastal regions from where it found its way through canal systems into the interior, where further distributiion is credited to birds and fish (apparently the passage through the predator's digestive tract causes no harm). The species great ecological tolerance (it can live in fresh water as well as salt water with a salinity limit of 17‰) is responsible for the species successful invasion of new regions. The species makes no specific demands on water currents, substratum or the fluctuations in chemical composition of the water (its pH tolerance is 6.5 - 8.5). P.antipodarum is resistant to partial dehydration and is not a choosy feeder, subsisting on detritus and decaying vegetable matter among others. European malacological observations have established that P.antipodarum is ovoviviparous (as in New Zealand) and individuals are capable of shedding up to 40 embryos; its longevity is 6-7 months, and individuals are able to reproduce when 4-5 months old.

The first record of the species in the Slovak Republic was on the 10/2/1994 when 1 mature individual was found near the village of Dobrohost, and in July 1944 4 other individuals were found near the village of Bodik by the author Cejka. An empty shell of P.antipodarum was found in the capital city Bratislava above the Lafranconi bridge on the right side of the Danube river.

Apart from the typical P.antipodarum form, several individuals with a minutely ciliate subsutural carina were also found by Kuchar in Bohemia. This form he calls aculeata Overton, while Powell's nomenclature is forma corolla Gould, 1847.

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Toheroa on Oreti Beach

by Glenys Stace

Introduction: Toheroa, *Paphies ventricosa* (Gray 1843), were once prolific along the exposed West Coast New Zealand beaches. A steady decline has been evident throughout the second half of this century until only remnant populations now inhabit the North Island beaches. The only population still able to sustain intermittent harvesting is on Oreti Beach, near Invercargill at the southernmost end of the South Island (Fig. 1). Open seasons of one day duration have been held there in 1990 and on the 18th of September, 1993. I was able to attend the second of these open days and subsequently returned to investigate some of the issues which arose during my visit. This article is an account of those visits.

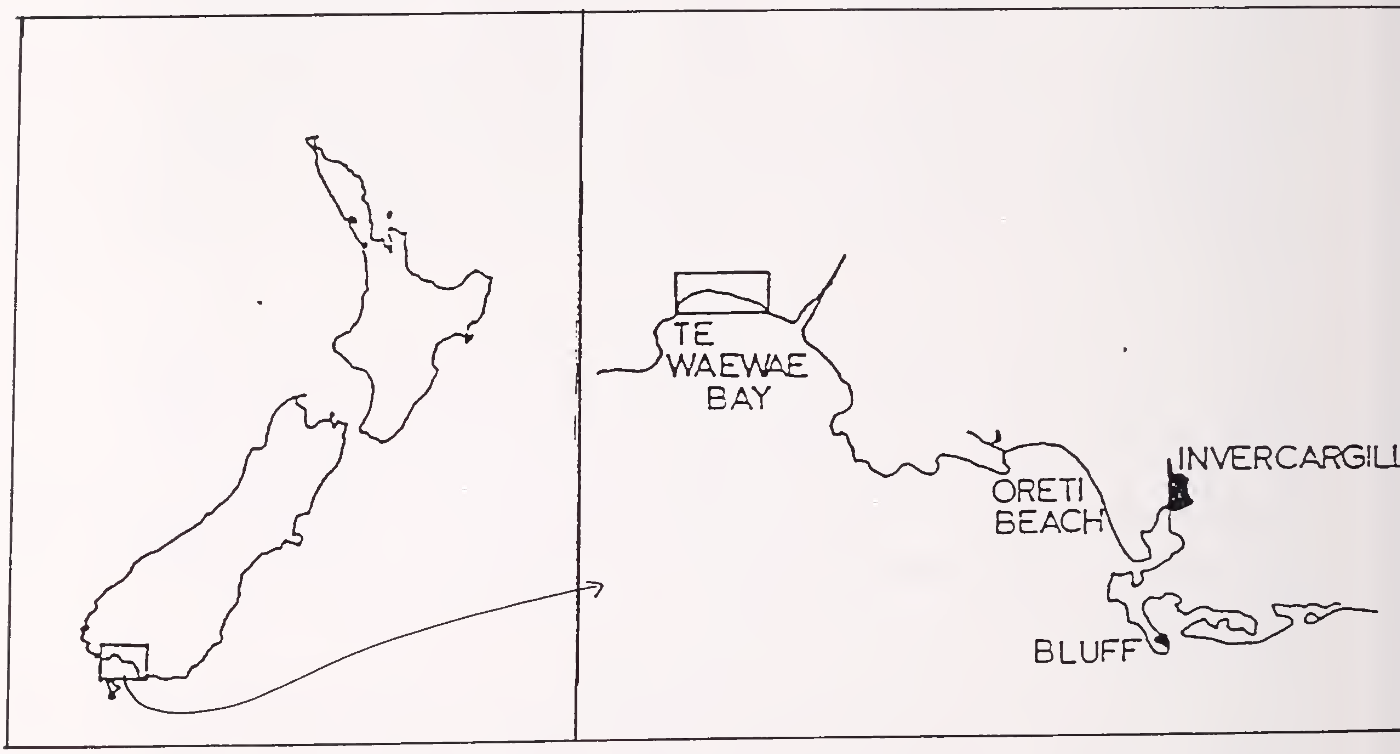

Figure 1: Location of Oreti and Bluecliffs (Te Waewae Bay) Beaches.

As dawn broke, still and mushroom pink, Local Kaumatua, George Te Au blessed Oreti Beach, near Invercargill and declared it open for toheroa gathering. The open season was only the second in twenty years. Already toheroa gathers paddled in the receding tide, anxious to be the first to gather the large, fat, elusive shellfish. People streamed onto the beach, most carrying a plastic bucket, and headed for the nearest likely spot.

Not everyone who came to the beach knew what they were looking for. The majority of diggers were locals, but among the 20.000 diggers (by MAFish estimation[1]), were people from Dunedin, Christchurch, myself from Auckland and one confused exchange student from Sweden. He had come to the beach with his extended

[1] NZ Fisheries Management: Regional Series No 3. "Review of the Southland Toheroa Fishery" MacKinnon & Olsen

host family and happily paddled in the freezing water looking for "tongues". Their grandmother waited at the water's edge with the youngest member of the family asleep in the stroller, resting against the family's large bag of toheroa. A cousin raced along the beach with his latest find. Holding it out for the sleeping baby to see, its large cream tongue dangling, searching in air to rebury itself. No wonder the Swedish student called them "tongues".

The toheroa season was THE event of the year in Invercargill. It seemed as if the whole city had abandoned work for the day and come to the beach. Neighbours who hadn't seen each other since the last toheroa season greeted each other with enthusiasm. Old friendships were renewed and new ones made. The beach was crowded by eight o'clock and diggers had to walk further along the beach before they found a bed, but when they did, it was instantly recognisable, lots of large round holes in the hard packed sand.

One man who successfully located the telltale holes was explaining to a woman what to look for. She smiled and explained that she had dug toheroa on Dargaville beach in the 1950's. He greeted her like an old friend. He had been a commercial digger for the cannery on Dargaville beach in the 1960's.

"There were so many we used to dig them with potato forks. When we dug for ourselves, we used an old number plate. Now it's much harder, hands only." (a reference to the MAFish regulation that allows them to be dug only with the hands). He removed two from one hole.

"This feels like coming home, " he grinned, "my mother used to make four hundred fritters for the "do" after the Dargaville golf tournament. Everyone expected toheroa fritters when they came to Dargaville. The butcher used to close up shop and go on holiday for three months when the toheroa season opened."

Adult toheroa live at about mid tide level on the beach. At low tide, the beds are usually completely exposed, and are identifiable by the large round holes the retracting siphons leave in the wet sand. Even so they are not always easy to locate. The limit of five toheroa per person seemed very few, especially to a northerner used to the local specimens occasionally washed up on the beach which would rarely reach the 100mm limit imposed by MAFish. There hasn't been an open season in the north since 1971. The toheroa on Oreti beach were very large and fat. Five would make a good meal for an adult . Of course there were rule benders. As a few people left the beach promptly after finding their quota, remarks were made about going down to the other beach entrance to collect five more!

MAFish officers inspected everyone's catch as they left. Parents and grandparents waited patiently for the return of their children who had disappeared up the beach. They couldn't leave the beach without their family or their hard won catch would be confiscated. Fortunately the weather was kind this time. The 1990 season took place in a blizzard. It snowed on the beach and snow filled the holes as fast as the diggers could dig. People were taken to hospital with hypothermia.

This year the weather was overcast with only the occasional breeze which came straight from Antarctica! The warmth of the locals made it a festive day. It didn't seem to matter if some didn't find their quota. Not surprising, considering that many were looking in the wrong place, or came to the beach too late, when the tide had already covered the beds. Although the beach was streaming with people it is doubtful that the estimated number of toheroa were actually taken. Juvenile toheroa were notably absent. I didn't see a toheroa dug that was not clearly above the 100mm limit. The MAFish officers collected very few, and there was little evidence of undersize specimens on the beach.

Before a decision is made to have an open season, a population survey of the beach is taken. This is in order to establish that satisfactory recruitment of juveniles is taking place and a special effort is made to measure the juvenile population.

In 1990, the pre-season survey was made in March and the post-season survey in October. Seven months elapsed between the pre-season and post-season surveys. The results are shown in Fig. 2.

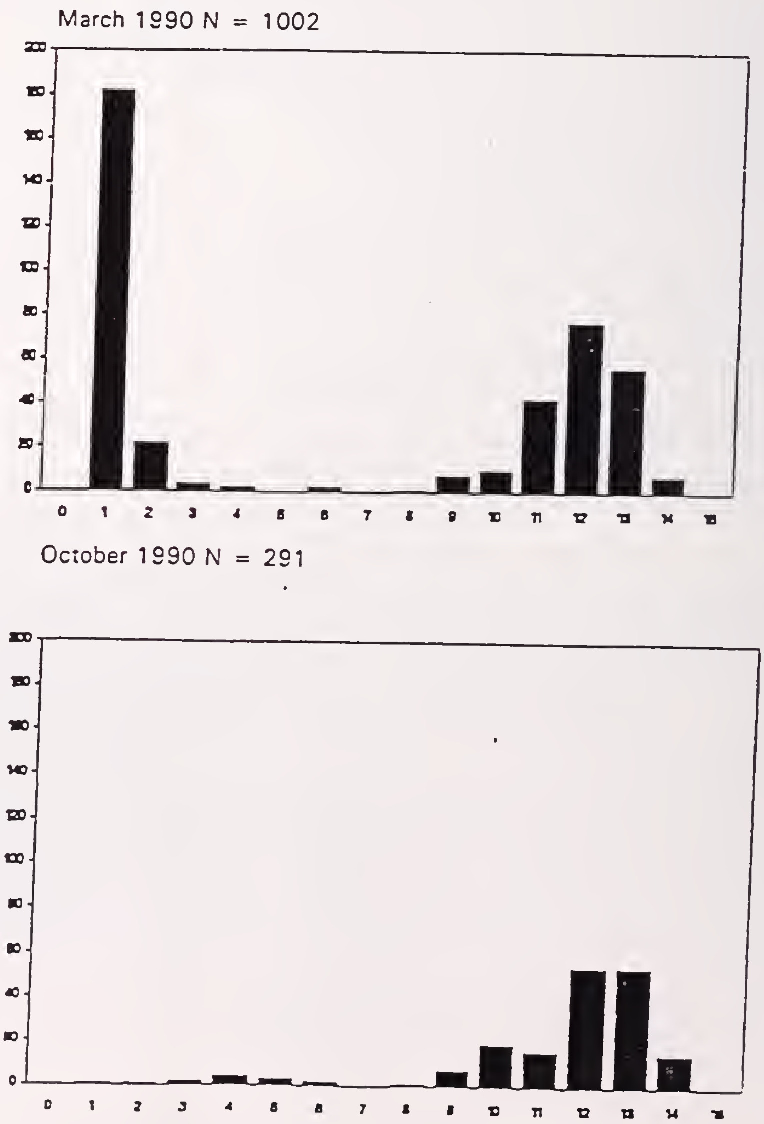

Fig. 2. March 1990 & October 1990 Oreti Beach Toheroa Survey

Toheroa surveys are traditionally done by the labour intensive transect and quadrat method, although research on alternative systems is in progress. In 1990, the beach was sampled with transects at intervals of 0.33km. Quadrat samples(1 x 0.5 m) were dug with garden forks to a depth of about 30cm along the transects from the mean low to the mean high water level. Every second transect was resampled for juveniles. Quadrat samples for juveniles were taken from mid to high water mark. The surface of the sand within each of these quadrats was carefully removed with a spade to a depth of about 3cm. The number was recorded and the individual lengths measured to the nearest 2mm size class

What was notable in both surveys was the absence of juveniles. MAFish justified the decision for an open day in 1990 by the large number of recruits entering the population. They were really only spat, none more than 2cm in length. Where were these recruits seven months later? They do not appear on the graph. No doubt there could be plausible explanations such as beds of juveniles in other locations. Unfortunately this is unlikely to be true and the sad fact has to be faced. They are probably all dead.

Juvenile populations of toheroa are the most vulnerable to all kinds of predation. They are closer to the surface, their shells are thinner and they live higher up the beach than their older relatives making them even more vulnerable. People, driving heavy vehicles over that area of the beach where they tend to reside, accounts for a substantial number. How this occurs is well documented in Peter Redfearn's Bulletin[2] Seabirds account for a great many. After a good spatfall, seabirds have been seen gorging themselves and regurgitating partially digested juveniles (up to 2.5cm) by the thousand. During long hot summer days, when neap tides may not reach large juvenile populations, stranded near high tide lines, for days at a time, suffocation and desiccation account for a high proportion. The population of paddle crabs (*Ovilapes catharus)* offshore from Oreti beach is very high. The beach is strewn with carapaces of all sizes. This predator is killing many juveniles lucky enough to survive their first year.[3] Paddle crabs are known to be predated upon by snapper (*Chrysophrys auratus*). The scarcity of this fish species in our inshore fisheries has allowed the population of paddle crabs to explode.

Present known reasons for mortality of juveniles taken into account, there is still an enormous difference between the numbers at spatfall and the total lack of a juvenile/ adolescent population between 2cm and 11cm. The reason for this can only be speculated upon. Is a certain age group being decimated by disease, bacterial contamination, parasitic selection or are they being specifically selected for predation by something other than sea birds or paddle crabs? The disparity between successful spatfall and their maturation is too great to be coincidence.

Curiosity about the absence of a growing population of juveniles was one reason that led me to take advantage of cheap air fares in November 1994, to return to Oreti for four days. Accompanied by Mike Eagle, we set out with the express purposes of searching for juveniles.

We did locate a bed of recent recruits. It was just to the right of the Surf Club beach entrance. The top edge of this bed was barely covered by high tide. Our digging was still evident next day, as the night tide had barely swashed over it .

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[2] Fisheries Research Bulletin No. 11, "Biology of the Distribution of the Toheroa *Paphies (Mesodesma) ventricosa* (Gray)" MAFish, 1974, Peter Redfearn

[3] NZ Journal Marine & Freshwater Research 21/1 1987, "Biology and Feeding in the NZ paddle crab *Ovilapes catharus* (Crustacea, Portunidae)" Haddon, W. & Wear, R.G.

Our survey of toheroa on the beach yielded no specimens between 27.5mm and 91mm in length. This result is consistent with my observations in 1993, the MAFish report 1990 figures and MAFish findings after the 1994 open season (pers. comm.). It indicates that juveniles are not surviving into their second year, and the majority of the population is conservatively estimated at least four or five years old and older (Fig. 3).

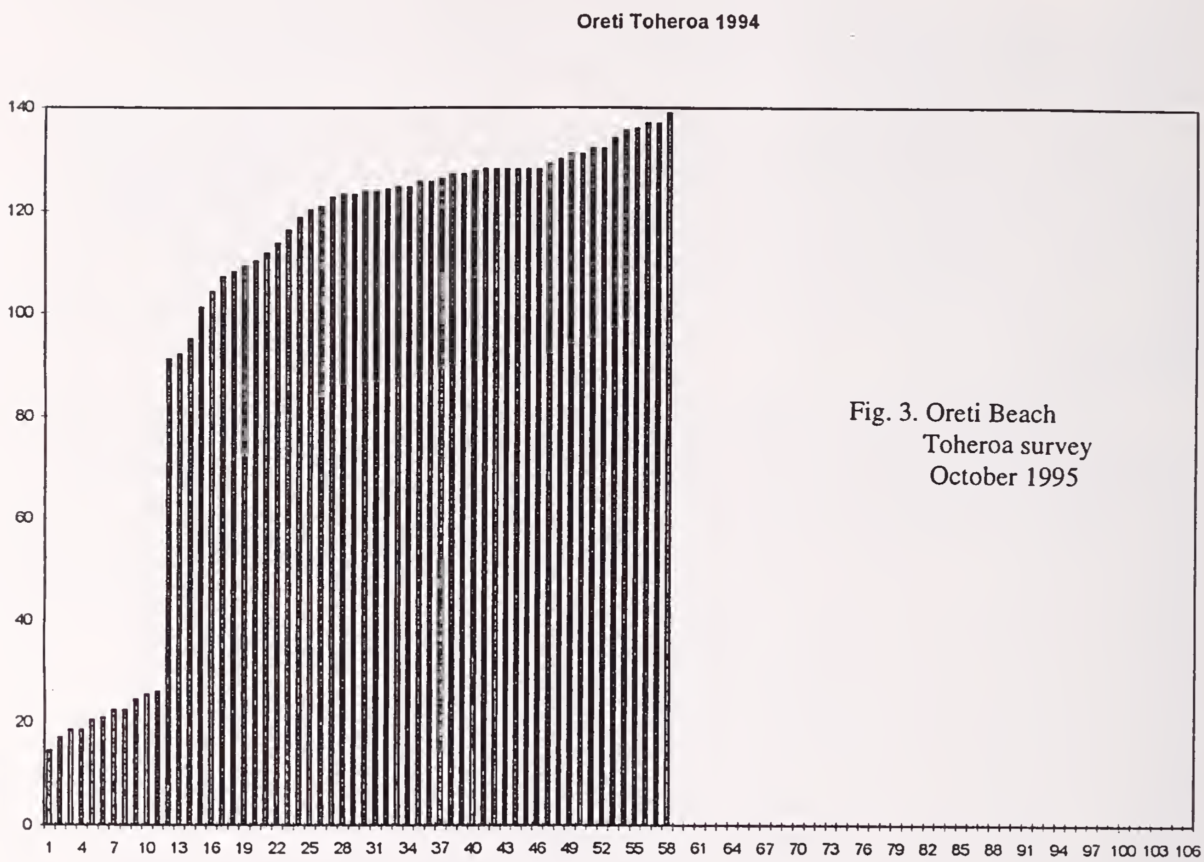

Fig. 3. Oreti Beach Toheroa survey October 1995

The total adult population on Oreti beach in the March survey was estimated to be between 1.04 and 1.42 million. The total adult population in October was estimated to be between .81 and 1.11 million toheroa, a difference of about 22%. From car counts and observation it was estimated that about 11,300 people participated in the toheroa season. Assuming that each person took their quota of five toheroa, about 56,500 toheroa were removed from Oreti beach, only about 5% of the total population. A decrease in population of toheroa over 100mm in length of 22% cannot be attributed to the open season.[4]

Mass mortalities are common among species that live in the exposed and sometimes violent open surf beaches and washups of toheroa are not uncommon. Oreti is no exception. It was easy enough to collect a large number of articulated double shells from the high tide line, to take back for future measurement and study. Again, the adolescent sizes were absent.

Our visit coincided with a period of neap tides. The toheroa beds were only partially uncovered at low tide. The time we could spend measuring them was even more than usually restricted. To our advantage, the weather was fine and working on

[4] Mc Kinnon & Olsen op. cit.

the beach reasonably pleasant. We had valuable help from people whose local knowledge contributed significantly to our limited success, however, they were unable to assist with the location of a juvenile population.

One of the tasks we had set for our study was to video toheroa burrowing. Dr Yasou Kondo and I had made a recording of toheroa borrowing during a small study of the burrowing rate, depth of burial and shore orientation of the Muriwai beach toheroa in April 1994.[5] We were hoping to extend this study with a video recording of the Oreti beach toheroa. I selected a representative sample of eight, allowed a depression in the sand to fill with water, placed the toheroa in ascending order of length in this depression and set the camera to record. On Muriwai the toheroa began to reburrow immediately and within minutes all were completely buried. The Oreti toheroa did nothing. We left the camera recording and continued to measure toheroa. By the time the tide reached our sample, only one had reburied. The experiment was repeated each day with similar results.

Another of the tasks we had set ourselves was the collection of sand samples and interstitial water. These samples were collected on the first day. On return to Auckland they were tested by Professor Michael Miller (Auckland University). The results were surprising. The salinity of the sample from the surf club area, at the end of the road, was 1.5 ppt and the sample from the south end, near the southern access to the beach was 2 ppt. So close to fresh water that the difference hardly mattered.

The beach was very wet during our whole visit. Locals commented that it had been a very wet winter with ponding in places they had not known to pond before. Seepage onto the beach was at an unusual maximum. It was hard to find toheroa by the siphon holes in the sand. We concluded that this was the result of toheroa withdrawing their siphons early, while the sand was still liquified. We now knew why. Being sensitive to the salinity of the interstitial water, the toheroa withdrew their siphons as soon as they sensed the drop in salinity. They would not reburrow in the low saline interstitial water that we were using for the video, but to our frustration reburrowed immediately we returned them to the incoming tide, where it was impossible to record them.

This experience raised some interesting questions for further study. One popular theory concerning the location of toheroa on the beach, is the location of seepage and the proximity of streams. Local experts on the location of toheroa insist that the beds are located where water from dune lakes seeps out onto the beach during periods when the beds are uncovered. An explanation for the disappearance of toheroa from Ninety Mile beach and Muriwai beach is the planting of pine forests and the draining of dune lakes. It has always been assumed that the reason for the choice of seepage sites is to remain wet during the hot days of summer, when the beds can be uncovered for long periods. The testing of the interstitial water is another interesting area requiring further study. There could be an optimum balance between requiring a constantly moist environment and the level of tolerance to fresh water.

We were able to measure the depth of burial, size, weight and orientation to the shore of a sample of reasonable size. The examination of this data will be the subject of another article. On a short trip to Bluecliffs Beach, Te WaeWae Bay, we located a few adolescents among the toheroa population. The size range there was marginally wider.

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[5] "Burrowing Ability and Life Position of Toheroa (*Paphies ventricosa:* Mesodesmatidae), an Unusually Large, Deep-Burrowing Ocean Beach Bivalve Endemic to New Zealand." Venus, Jap. Jour. Malac. 54, 1 (1995): 67 - 76, Kondo, Y. & Stace, G.

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Climo, F.M. 1976 The Occurrence of *Theora (Endopleura) lubrica* Gould, 1961 (Mollusca: Bivalvia: Semelidae) in New Zealand. CSAM Bulletin No1 (New Series) April 1976

Hayward, B.W. et al. 1994 Benthic Ecology of Whangape Harbour, Northland., Rec. Auckland Institute and Museum 31: 219 - 230

Hayward, B.W. and Hollis, C.J. 1993 Ecology of Waimamaku River Estuary, North of Kawerua, North Auckland, Tane 34: 69 - 78.

Key:
1. Whangaroa
2. Orakawa, Bay of Islands
3. Tutukaka
4. Great Barrier Island
5. Firth of Thames
6. Auckland
7. Marlborough Sounds

Fig. 2. Map to show the present distribution of *Theora lubrica* in New Zealand.

Extension of Range in New Zealand for *Theora (Endopleura) lubrica* Gould, 1861: Semelidae

by Margaret S. Morley

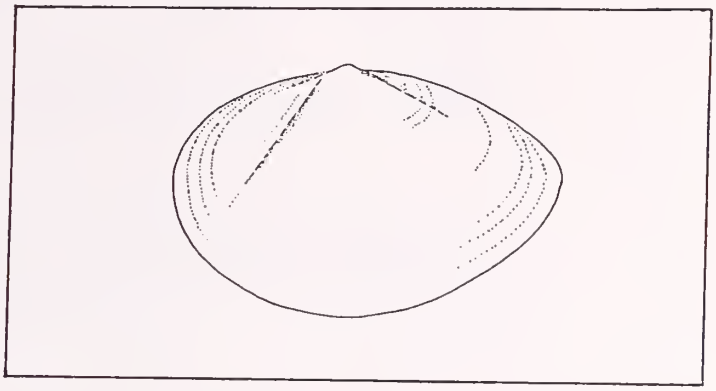
Theora lubrica (Fig. 1) is a small, fragile, shiny white bivalve endemic to Japan. This species was first found in New Zealand in dredgings at a depth of 4 - 6m at Orakawa Bay, Bay of Islands in 1971 (Powell, 1974)

T.lubrica has subsequently been collected from Tutukaka, Whangaroa, Marlborough Sounds, Firth of Thames, Great Barrier Island and Auckland Harbour e.g. Island Bay, Tamaki Estuary and Waiheke Island. (Fig. 2).

This wide distribution suggests that *T. lubrica* arrived in New Zealand as a natural invader from South East Australia, where it has also been introduced, rather than by shipping.

Fig. 1. *Theora lubrica,* Herekino specimen

Length, 7.1mm, Width, 4.5mm



Theora lubrica found on the West Coast of New Zealand.

On the 25th November 1994 I sieved a single live specimen from low tidal mud at Owhata Beach, Herekino Harbour on the West Coast of Northland. (Fig. 3) Although approximately thirty 0.4 sq.m. sites were sieved intertidally and four one litre dredge samples from the channel in depths of 2 - 4m were examined, no other specimens of *T.lubrica* were found.

Other West Coast Studies:

1. Benthic Ecology of Whangape Harbour, Northland.(Hayward, 1994)

In April 1992, 40 dredge stations were examined. No *T. lubrica* was found. It was noted by the authors that conditions were suitable for this introduced species to settle.

2. Ecology of Waimamaku River Estuary, North of Kawerua, North Auckland, (Hayward & Hollis, 1993). In 1993, 24 stations were dredged but no *T.lubrica* was found.

Discussion

The Herekino Harbour has extensive areas of low tidal mudflats which are a potential habitat for *T.lubrica*. Since *T.lubrica* is a gregarious species, future surveys may find high density populations such as those which have been established in the Tamaki Estuary.

Or did I take the first and so far only *T.lubrica* to grow to maturity in Herekino Harbour?

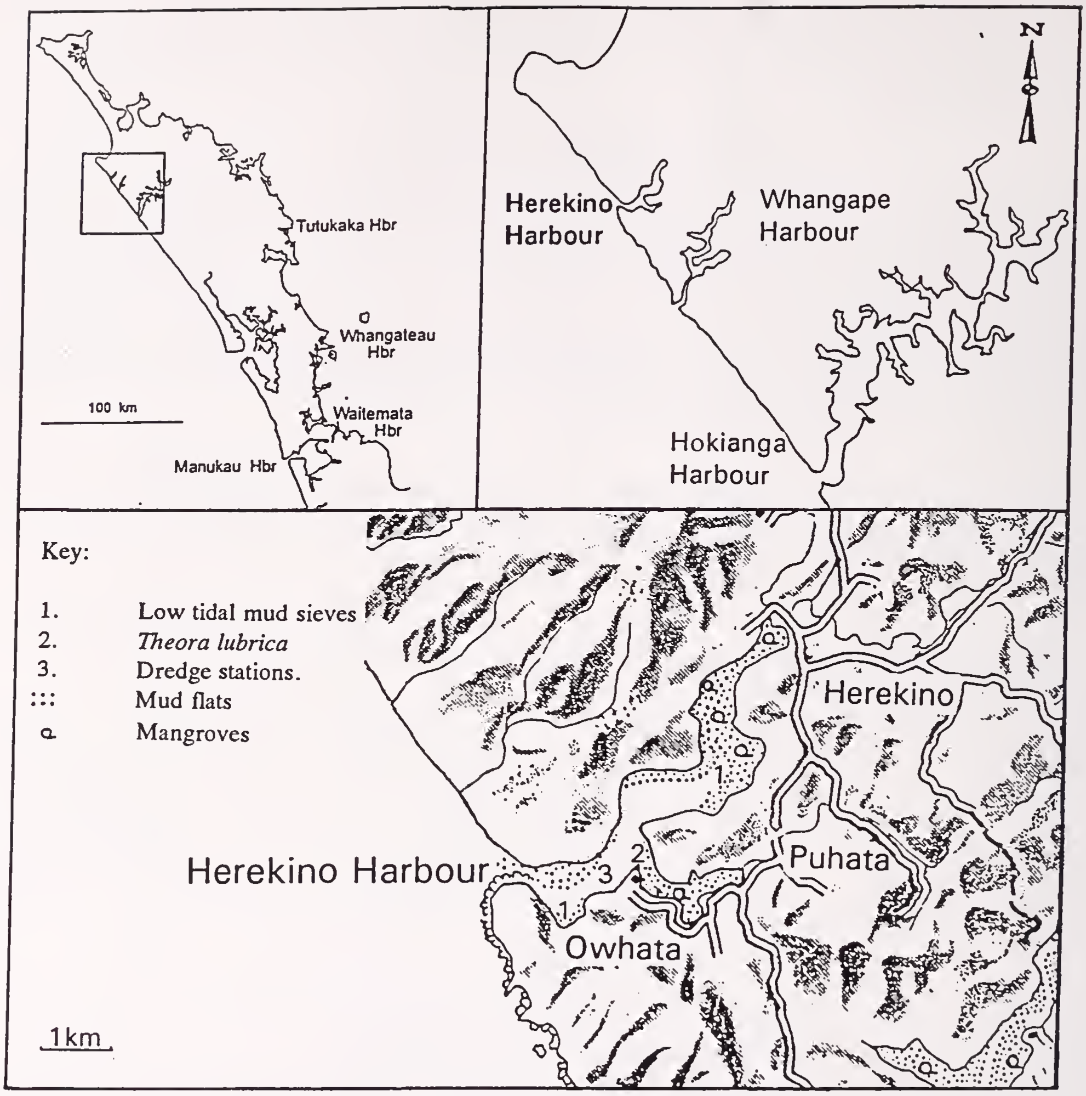


Fig. 3. Location of sampling stations in Herekino Harbour

A Belated Literature Search

by Margaret S. Morley

In the previous "Poirieria"[1], I wrote a short article on *Larochella miranda*. Dr Bruce Marshall has since called my attention to his paper on this species.[2] In this paper he places *Larochea* in the family Scissurellidae.

[1]Poirieria Vol 17: 3 March 1995
[2]Marshall, B.A., The Systematic Position of *Larochea*, Finlay, 1927 and Introduction of a New Genus and Two New Species. (Gastropoda Scissurellidae). Journal of Molluscan Studies (1993) : 59, 285 - 294

Discovery of Three Lost Landsnail Species

by Bruce Hazelwood

Owing to the passage of time, and also to a massive oversight, a publication by Henry Suter, 1913, has only now come to light. This paper:

Descriptions of Three New Species of Land Shells from New Zealand by Henry Suter, Read 9th May 1913 from the Proceedings of the Malacological Society Vol X, Part IV, September 1913.

The species are :

Endodonta (Charopa) longstaffi, Suter 1913
Type: Orepuki, Southland, New Zealand.
Named in honour of Mrs G.B.Longstaff, F.L.S., who discovered the species when visiting New Zealand in 1910.

Thassohelix pygmaea Suter 1913
Type: Woodhaugh, Otago, New Zealand (Mr G. W. Howes) one specimen.

Laoma (Phrixgnathus) gracilis Suter 1913
Type: Woodhough, Otago, New Zealand (Mr G. W. Howes) one specimen.

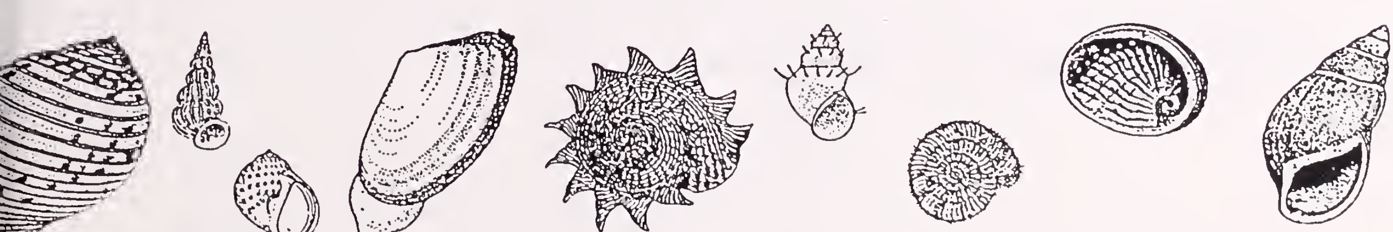
All types are in the Suter Landsnail Collection, housed in the Museum of New Zealand, Wellington.

Notes:

1. A single specimen of *E.(C) longstaffi* Suter 1913, a co-type, was deposited in the Auckland Institute and Museum, presumably by Suter himself. (pers. comm. Jim Goulstone).
2. Evaluation of these species is in progress.
3. Suter was in error! *longstaffi* should read *longstaffae.*

Thanks to Bruce Marshall, Dr Frank Climo and Karen Mahlfeld

Ed. note: The reason for 3 should be explained in Frank Boulton's article on nomenclature.



HELMET SHELLS FROM WAIHI BEACH
by Nancy Smith

Semicassis Morch,1852 = Xenophalium Iredale,1957

Beu and Maxwell propose that those molluscs which we call *Xenophalium* are really *Semicassis*. As they have already been called *Cassis, Cassidea, Phalium* and *Xenogalea* I guess one more change won't worry them although it might upset some shell collectors. Along with the change of genus we get a change of specific name from *labiatum* (adjective; like a lip) to *labiata*. *Pyrum* (noun; a pear) stays the same. *Semicassis* is the accepted name in Australian Marine Shells Vol.1" Barry Wilson and in Vaught's classification. "Australia like New Zealand has a plethora of subspecies or forms which both Beu & Maxwell and Wilson find of no biological significance.

On 2nd Nov.1992 there was a big washup of seagrass at Waihi Beach in the Bay of Plenty, something I had never before seen at Waihi although it is a perennial problem on beaches in the Tauranga Harbour. Half buried in the sand and seagrass were hundreds of *Semicassis*.They may have been washing around on the tideline for some days as many of them had animals still in them but few or none were still alive and the smell was pretty ripe.

Over the years in the Bay of Plenty I have found a sprinkling of *Semicassis pyrum* (Lamarck,1822) and an occassional *S.labiata* (Perry,1811) usually in big *Struthiolaria* washups.In 1991 it was basically *Semicassis* with a good sprinkling of *Struthiolaria papulosa* including a few dwarf specimens 45-50mm high with very thick mature lips, some still alive *Austrofusus glans* and in one area lots of *Atrina*. In a "gathering frenzy" my companions Rae Sneddon and Peggy Town and I each gathered 2 supermarket plastic bags of shells, mostly the helmets, and we drove home with all car windows wide open.Our driver said she had no trouble with tailgaters!

I ended up with 134 *Semicassis,* 66 *S.pyrum* and 68 *S.labiata*. The less said about cleaning them the better except that of the shells that were reluctant to come clean, 23 were *S.pyrum* and only 8 were *S.labiata*.The *S.pyrum* were very variable in size, shape, colour, denticulation and nodulation.Heavy, mild or light denticulation of the outer lip combined randomly with smooth, heavily or lightly or partly noduled shoulders. I could easily have ascribed shells to most of the subgenera listed in Powell 1979. Some of the larger *S.pyrum* had no nodules on the shoulders and were superficially very like *S.labiata* but I had no problem distinguishing the one from the other, because the *S.pyrum* all had fine spiral grooves on the shoulders of the early whorls and the *S.labiata* did not. R.Tucker Abbott in his monograph of the *Cassidae* 1968 suggested that the two species were probably hybridising in South Africa and perhaps also in New Zealand but in this mixed collection from the one washup I found some consistent differences. The *S.pyrum* all had spiral lines round the anterior of the body whorl, sometimes several deep grooves, or else fine striae or almost microscopic lines.The *S.labiata* mostly didn't have these but 8 of them had some faint lines.

Other things were:-

S.pyrum yellow protoconch
callus shield on inner lip yellow
labial varix variable, flared or slightly recurved
sometimes an extra varix or two on the whorls
early whorls smooth or noduled, straight or convex

S.labiata pink protoconch
callus shield on inner lip white
labial varix always recurved and thicker than *S.pyrum*
none with an extra varix
early whorls always smooth and convex

The channel running behind the callus shield into the umbilicus looked narrower in the *S.labiata* but I did not try to measure it. (Beu and Maxwell mention this as diagnostic.)

I could not differentiate *S.labiata labiata* from *S.labiata inspirata* as there were all possible combinations of shoulder nodules or not, with the inside of the outer lip either very dentate or slightly dentate or smooth, the labial varices thick or thin but all were strongly recurved. I could not see any significant differences in shape , colour, varix or inner lip callus between the shells with nodules on the shoulder and those without.There was a range of colours and patterns. Powell suggests that *S.inspirata* may be just an ecotype and Abbott says it may be a hybrid of *S.pyrum* and *S.labiata*. Wilson calls it a "nodulose form from New South Wales" which again suggests an ecotype, but mine were all mixed up in the same washup, as though they had come from the same area. However many of the shells had healed cracks on the back of the body whorl but on about half a dozen of the *S.labiata* the healed break on the dorsum was large and irregular and had been deep. I thought these marks were possibly bites from fish that were not quite big enough to tackle these molluscs. Although some of the *S.pyrum* had slight healed cracks not one had a "fish bite" mark. This could be a sign of different habitat.

It appears to me that *Semicassis labiata* and *Semicassis pyrum* are quite distinct, but that most of their forms and subspecies are probably only normal genetic and/ or ecological variations.

References:- Powell A.W.B. 1979 New Zealand Mollusca
Beu & Maxwell 1990 Cenozoic Mollusca of New Zealand
Abbott R.T. 1968 The Helmet Shells of the World(Cassidae)
Wilson Barry 1993 Australian Marine Shells Vol.1

Ed note: Frank Boulton's articles on Taxonomy will explain the name endings over the next few issues.

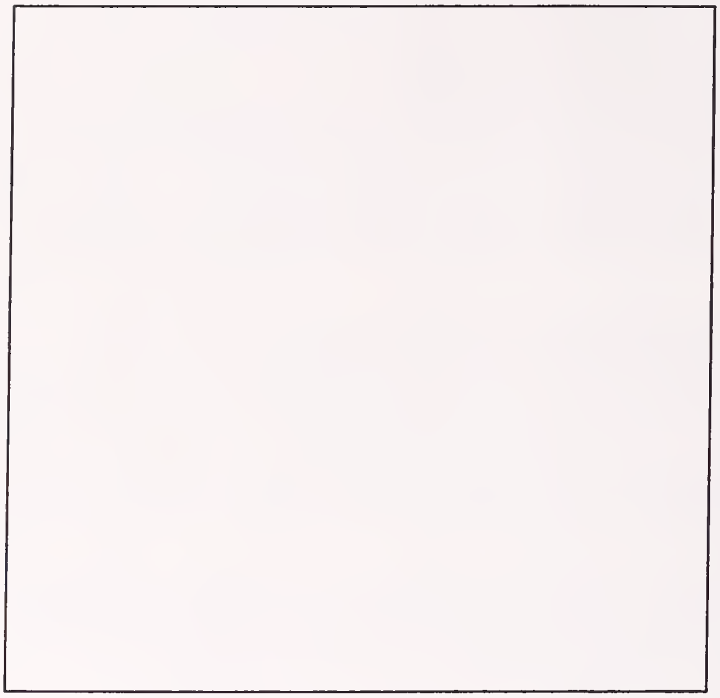
New Nudibranchs in New Zealand waters or just visitors?

By Tony Enderby

Photographs by Tony & Jenny Enderby

Three species of the family Tambja have been identified in the waters off northern New Zealand. They are T. morosa (Bergh 1877), T. verconis (Basedow & Hedley 1905), and T. affinis (Eliot 1904).

All three were first found in the early 1970s when a large number of species of marine animals new to New Zealand were discovered at the Poor Knights Islands off Tutukaka.



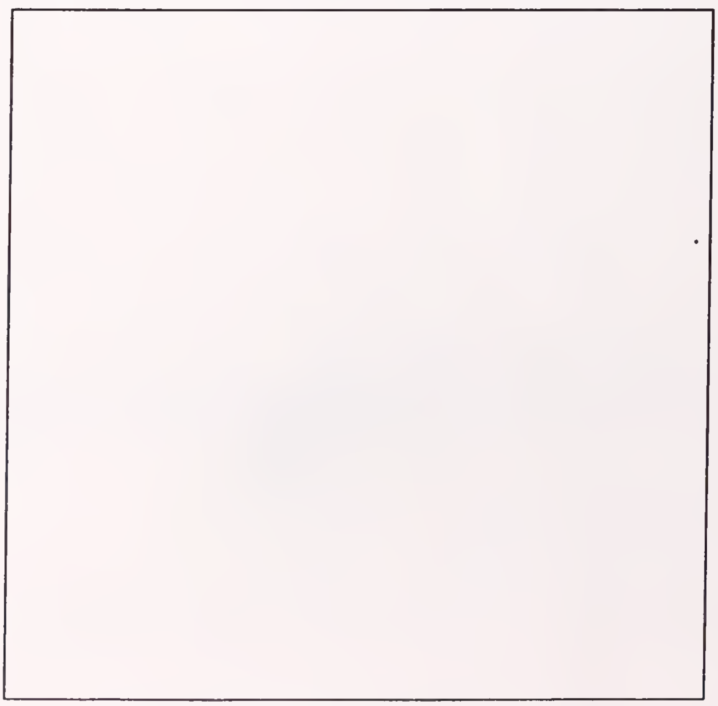
Jason mirabilis on the Rainbow Warrior

The other significant nudibranch find was the beautiful Jason mirabilis (Miller 1974) which was previously unnamed. This animal is found all over New Zealand living on the Solanderia hydroid. The wreck of the *Rainbow Warrior* is a favoured habitat with large numbers occurring there.

All three of the Tambja species were present until the mid 1970s after which only the dark green and brilliant blue T. morosa was found. Colonies of this species could be easily found on the blue/green Bugula bryozoan in Middle Arch and also on the southern side of Northern Arch on Tawhiti Rahi Island, the northern most of the Poor Knights group. It was also found less frequently at other sites at the islands.

Strangely the colony which had been established on the large rocks in Middle Arch disappeared in 1993. Although I have dived the area numerous times I have not seen a single specimen in the area since.

At about the same time the most beautiful Tambja, the bright yellow and blue verconis was found at the Poor Knights. The first sighting was of a small 25mm specimen in Middle Arch, also living on the Bugula bryozoan.



Tambja morosa on Bugula bryozoan

A photograph of this specimen was a prize winner in the 1993 Oceans Underwater Photographic Competition. No one else had seen the animal at that stage.

By early 1994 this animal could be found on almost any dive at the Poor Knights. Most of the animals being large, up to 80mm.

The numbers dropped off during the winter of 1994 to almost none at the end of the year. When diving the Poor Knights over a five day period in December/January 1994/95 I did not see a single specimen.

In March 1995 they began to reappear but all those seen were between 25 and 40mm but again were seen on most dive sites at the islands.

On a dive on an extremely rough day at the Poor Knights in June 1995 (so rough in fact that we did not take a camera down), I was diving with my wife Jenny in the Canyons area between the two main islands and Motu Kapiti Island.

Below me at 90 feet depth she began waving arms and pointing wildly. Swimming over I discovered she had found a mating pair of yellow and green longitudinally striped nudibranchs. The larger specimen being 140mm and the smaller one about 80mm.

This is the sort of thing you read about . . . something fantastic to photograph and no camera. We did note the exact location and returned to the area on the next dive trip but to no avail. To date we have not found any further evidence of this species and would appreciate any information on any possible sightings of this animal sightings.

These were T. affinis (?) we think although it was known as Nembrotha kubaryana back in the 1970s. As far as I know it had not been seen for the last 20 years in New Zealand.

A mating pair of Tambja verconis

The size of the larger animal was also of interest as Coleman in Nudibranchs of the South Pacific lists it as 70mm. The larger of the pair seen at the Poor Knights was double that.

None of the Tambja species are recorded in Powell, although Jason mirabilis did make it into print. Locality was given for J. mirabilis as between Cape Brett to Bay of Plenty. It is now seen regularly in Fiordland and as far south as Stewart Island.

There is no way of knowing whether these creatures are infrequent arrivals here or were just not discovered before the advent of scuba diving.

They are certainly worth noting on any dive at the Poor Knights Islands.

My records now date back twenty years from the Poor Knights Islands and this does give a reasonable record (with gaps) of when they were present.

Unfortunately my knowledge of nudibranch species was not as good then as it is now and some of my identification at the time may not be correct.

One thing is for sure, these animals are certainly a welcome addition to the New Zealand fauna and the colours are certainly made for a photographer with a macro lens on an underwater camera.

We will continue to look for any new arrivals at the Poor Knights and at other locations where we dive. It is arguable whether these animals are new arrivals or are infrequent visitors and if the water temperature is to their liking begin to breed until a change in the climate may see them disappear for a time. I prefer to support this latter theory which can also be applied to other species such as Cypraea vitellus which has again been seen live at the Poor Knights recently and numerous fresh dead specimens reported. Unfortunately C. cernica tomlini has not been seen for more than 10 years.

If anyone has further information or sightings of any new species along the Northland coast or the offshore islands I would be interested to hear of them.

Contact Tony or Jenny Enderby on Auckland 814 9012.

A CHECKLIST OF THE MOLLUSCA OF THE KIRITIHERE COASTLINE

Austin J.W. Hendy and Michael K. Eagle

ABSTRACT

The survey of the Kiritihere rocky reef coastline fauna from Tapirimoko Point in the south to the third bay (un-named) north of the farm walkway coastal access point, resulted in the recording of 66 species of marine mollusca (42 species of Gastropoda, 20 species of Bivalvia, 3 species of Polyplacophora, and 1 species of Cephalopoda).

GEOGRAPHY

The rugged west coast shoreline is topographically more variable than other coastal habitats (Eagle, 1994), contrasting strongly with the western coastline further north which consists of exposed sandy beaches, sheltered harbours and estuaries (Hendy, 1995). The survey area is located south of Kiritihere Stream, south Marakopa area, between the third (un-named) bay north of the farm walkway access and Tapirimoko Point to the south of it (Fig. 1). The local geomorphology ranges from steep, overhanging cliffs, to wide, wave cut, shore platforms' from smooth, uniform slopes, to dissected, scree drift masses and extensive marine sedimentary boulder beaches. This portion of the Kiritihere coastline is continuously exposed to the oceanic swell of the Tasman Sea and the salinity, temperature and current turbidity are subject to wide variation.

OBSERVATIONS

A beach-drift collection was made of the shoreline and live animals were observed only and not taken; shells are held in the authors collections. The inter-tidal zone was well studied and reflected the sessile and sluggish nature of the common species whose populations were therefore easily estimated (Table 1). Although this investigation is entirely taxonomic in its description, emphasis should be given to the importance of understanding the dynamic relationships between the organisms recorded and their physical and biological environment.

Epifaunal species inhabiting stable, open rock surfaces, were notably the gastropods *Haliotis*, *Cellana*, *Notoacmaea*, *Melagraphia*, *Micrelenchus*, *Littorina*, *Lepsiella*, and the bivalves *Perna*, *Xenostrobus*, and *Cliedothaerus*. Maintaining position in the face of strong water movement involved these mollusca: possessing adaptive features (cementation, byssus threads, and prehensile feet); changes in orientation to minimise shear stress; use of crevices and water flow channels; and irregular surface contours to reduce turbulence and minimise drag.

The high shore, intertidal organisms, *Littorina* and *Nerita*, both with reduced apertures, were clustered in crevices to prevent dehydration and the relatively warm temperatures of the fine day that they were observed. Algal grazing predominated among the gastropods as dud suspension feeding amongst the bivalves.

The zoned distributions encountered were primarily created by the varying responses of marine organisms to environmental stresses related to the physical rigours of the tidal environment. Competition, however, for limited resources (mainly space), predation, and grazing were also important determinants of the zonation. Those species which are known to be regulated by predation (or grazing) are predominantly sessile. A downward shift in the normal distribution of the mussel *Perna canaliculus* in several places suggested a lack of the principle predator, the starfish, *Strichaster*. Common mobile species such as the gastropod *Thais orbita* , which compete mainly for food rather than for space, appeared less likely to be predator-limited. It was notable that the physical disturbance appeared to be particularly important in organising boulders and cobbles over and over, drawing them down in the backwash and regurgitating them shoreward again in the swash zone. Consequently only the most opportunistic species was established; a live *Venerupis (Paphirus) largillerti* was seen re-burrowing into the water-driven beach-scree.

The wave swept stone beaches of Kiritihere predominate in a variety of gastropods. Occasional rare visitors, such as *Mitra carbonaria*, are found washed ashore amongst beach drift consisting commonly of *Cookia sulcata, Diloma niggerima, Cellana* spp., *Haliotis (Paua) iris, Nerita (Austrolittorina) unifasciata antipodum, Austrofusus glans, Perna canaliculus, Xenostrobus pulex*, and the cosmopolitan oceanic drifter, *Spirula spirula.* The Kiritihere rocky shore can be visualised as mosaics of patches which, depending of the intensity and time of disturbance, will be at different stages in the successional sequence towards competitive dominance.

Table 1. **South Kiritihere coastline mollusca species list**

Key: ••• = abundant, •• = common, • = uncommon
Nomenclature follows Powell (1979) except in a few instances where updating is required.

PHYLUM MOLLUSCA Class Polyplacophora	Abundancy
Amaurochiton glaucus	••
Sypharochiton pelliserpentis	•
Chiton sp.	•

Class Gastropoda

Superfamily Pleurotomariacea	
Haliotis (Paua) iris	• •
Haliotis (Sulculus) australis	• •
Superfamily Fissurellacea	
Emarginula striatula	•
Tugali elegans	•
Superfamily Patellacea	
Cellana denticulata	•
Cellana ornata	•
Cellana radians	• • •
Cellana stellifera	•
Notoacmea (Parvacmea) daedala	• •
Notoacmea pileopsis pileopsis	• •
Superfamily Trochaea	
Caliostoma punctulata	•
Cantharidella tesselata	•
Cookia sulcata	• •
Diloma niggerima	• • •
Melagraphia aethiops	• •
Micrelenchus dialatus	•
Turbo smaragdus	• • •
Superfamily Littorinacea	
Littorina (Austrolittorina) cincta	• •
Littorina (Austrolittorina) unifasciata antipodum	• • •
Superfamily Nertiacea	
Nerita atramentosa melantotragus	• •
Superfamily Cerithacea	
Maoricolpus roseus roseus	•
Superfamily Strombacea	
Pelicaria vermis vermis	•
Struthiolaria papulosa	• •
Superfamily Calyptracea	
Sigapatella novaezelandiae	• •
Zegalerus tenuis	•
Superfamily Naticacea	
Tanea zelandica	•
Superfamily Tonnacea	
Cassis pyrum pyrum	• •
Superfamily Ranellidae	
Cabestana spengleri	•
Charonia capax	•
Superfamily Muricacea	
Xymene ambiguus	•
Thais obita	• •
Lepsiella scobina scobina	• • •
Haustrum haustorium	• •
Superfamily Buccinacea	
Cominella adspersa	•
Cominella maculosa	• •
Austrofusus glans	•

Buccinulum linea linea	•
Penion (Sulcatus) dialatus f adustus	•
Superfamily Volutacea	
Amalda (Gracilispira) novaezelandiae	•
Alcithoe arabica	•
Alcithoe swainsoni	••
Mitra carbonaria	
Superfamily Siphonariacea	
Siphonaria (Zelandica) australis	•

Class Bivalva

Superfamily Arcacea	
Barbatia novaezelandiae	•••
Superfamily Mytilacea	
Perna canaliculus	••
Xenostrobus pulex	•••
Superfamily Ostreacea	
Crassostrea glomerata	•
Superfamily Pectinacea	
Chlamys zelandiae	•
Superfamily Anomiacea	
Podesmus (Monia) zelandicus	••
Superfamily Lucinacea	
Zearcopagia disculus	•
Superfamily Mactracea	
Mactra discors	•••
Zenatia acinaces	•
Spisula (Crassula) aequilateralis	•
Paphies australis	•
Paphies (Mesodesma) subtriangulata subtriangulata	•
Superfamily Tellinacea	
Tellina (Peronidia) gaimardi	•
Superfamily Veneracea	
Dosinia (Austrdosinia) anus	••
Dosina zelandica zelandica	•
Venerupis (Paphirus) largillerti	•
Protothaca (Tuangia) crassicosta	••
Austrovenus stutchburyi	•
Superfamily Hiatellacea	
Hiatella arctica	
Superfamily Pandoracea	
Cliedothaerus albidus	••
Myadora striata	••

Class Cephalopoda

Family Spirulidae	
Spirula spirula	••

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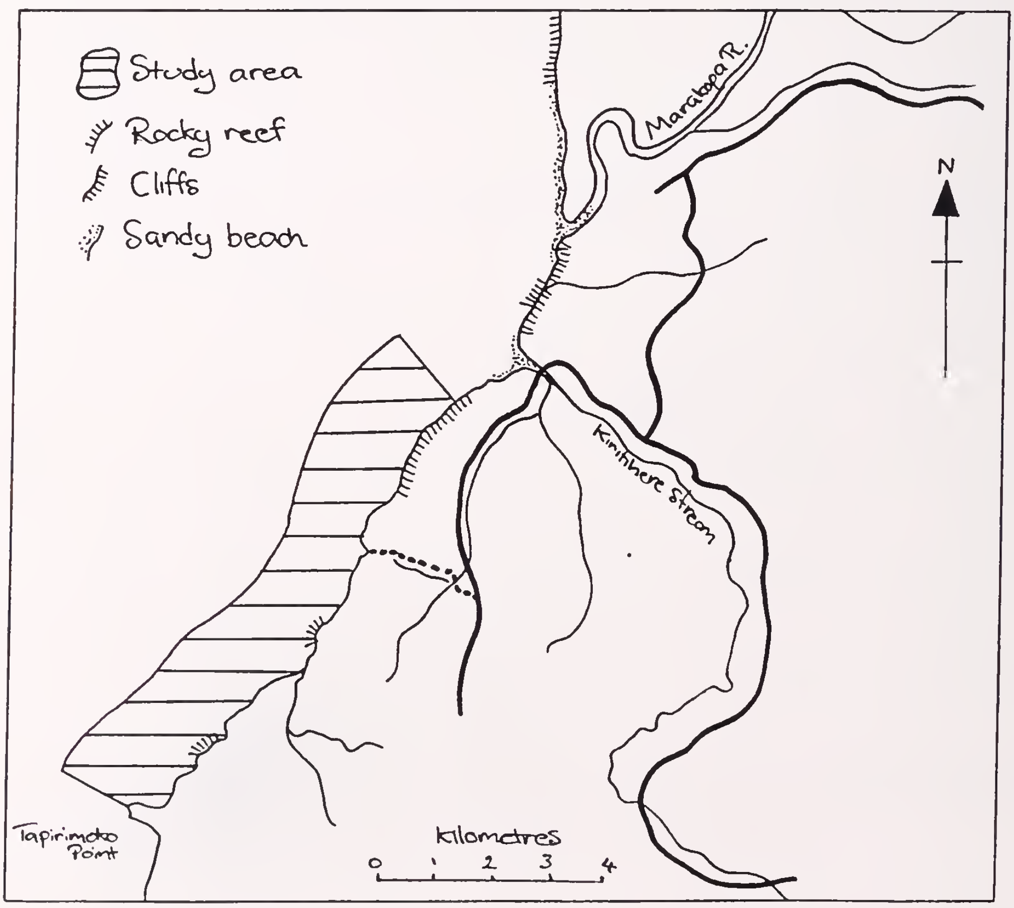
Fig. 1 **Location map of the Kiritihere coastline surveyed**



REMEMBERING SCIENTIFIC NAMES

Part 1: Adjectival Endings

by Frank Boulton

Introduction

This is the first of a series of articles, which deal with the problem of memorizing the scientific names of animals and plants. Special attention will be given to the names of mollusca and in particular to New Zealand species.

A number of techniques can be used to help memorize the scientific species names. They fall into three broad categories. Firstly, an understanding of the linguistic structure and meaning of the names can assist the task of memorization. Secondly, some of the techniques used by linguists to commit new vocabulary to memory can be called into service. After all, the task ahead of us is to do nothing more than remembering new words of very foreign appearance. Thirdly, we can do some confidence-building. The greater our confidence in our ability to perform a task, the greater our degree of success in accomplishing it.

In this article we shall be looking at the way in which the endings of words change in Latin. I do not intend to be linguistically rigorous. Committing the whole of the grammar of Latin and Ancient Greek to memory would be a remarkably inefficient way of remembering a few thousand species names. We need a few simple guidelines, which will help in the majority of cases. The exceptions will still need to be learned by rote. Many readers will have wondered why the same word occurs over and over again in the species names but with slightly different endings. Why do we have *Fissidentalium zelandicum*, *Tanea zelandica* and *Serpulorbis zelandicus*? If we can answer this question by giving a few simple rules, then we don't have to burden our memories with having to remember the correct ending in every single case.

Before we begin, though, a simple observation should help to give a little more confidence in our ability to learn all these names. We tend to talk about *Latin names*. Nothing could be more misleading. The names are certainly Latinate but they can hardly be called Latin. They would be more incomprehensible to the most highly educated Roman than they are to us. A large portion of the names contain very familiar personal names and place names from familiar modern languages such as English, Māori, French and German. So, don't call them *Latin names*, because in doing so, you are only telling yourself that these words are less familiar than they really are.

Gender

In Latin and Ancient Greek each noun had a gender. There were three genders in these languages: masculine, feminine and neuter. That sounds straight forward enough. After all, in English we distinguish between he, she and it. However, the distinction in English is based more clearly on natural sex than is the case with Latin or Greek. In these languages, male beings usually had masculine gender and female beings feminine gender. However, inanimate entities could be masculine, feminine or neuter. *Fungus*, a mushroom,

was always masculine, *manus*, a hand, was always feminine and *opus*, work, was always neuter. Each noun had a gender, which was usually rigidly fixed by usage. To complicate things even further some animate beings, in particular young animals(including children) were neuter. Any adjective describing a noun had to *agree* with it in gender. So, a big mushroom was *magnus fungus*, a big hand was *magna manus* and a big work was *magnum opus*. Fortunately for us, those privileged to name new species were not usually classical scholars and so they tended to keep matters relatively simple.

Of the huge array of different adjectival endings, which existed in Latin and Greek, we can ignore the Greek forms completely and three very common patterns of endings from Latin cover well over 90% of cases. In the most common pattern the masculine form ends in *-us*, the feminine in *-a* and the neuter in *-um*. The next most common pattern had the masculine and feminine ending in *-is* and the neuter in *-e*. And finally we have forms which end in *-ns* preceded by a vowel and these had the same form for all three genders. Those of you who studied Latin or Greek at school will be heaving a sigh of relief over the fact that we need not trouble ourselves with plural forms and we need not worry about cases other than the nominative. As an example of the first pattern we have *zelandicus*, *zelandica*, *zelandicum*. *Viridis*, *viridis*, *viride* is an example of the second pattern. *Vivens*, *vivens*, *vivens* is an example of the third pattern.

These changes in the ending of the specific name only apply if the specific name happens to be an adjective describing the genus name. When the specific name is a noun it does not vary with the gender of the genus. It should be noted that subspecific names are subject to the same rules as specific names are.

Genus names can be considered as always being nouns. This statement is not linguistically accurate but suffices for the present purpose as they will always behave as nouns and will always have a fixed gender.

Now that we know that specific and subspecific names agree with the genus name in gender, the obvious question is how are we to know the gender of the genus name. Those of you who had to study Latin or Greek at school will be throwing up their hands in horror at this point. Fortunately, genus names tend to avoid the complications of gender which make classical Latin and Greek nouns so difficult. A few simple rules will cover the vast majority of genus names.

Genus names ending in *-a* are feminine. The only significant exceptions to this rule are genus names ending in *-ma*, which are feminine if they are of Latin origin but neuter if they are of Greek origin. Thus, *Diloma* is feminine but *Calliostoma* is neuter. In a later article, it will be shown that in many cases it is relatively easy to spot the Greek(and hence neuter) genus names in *-ma*. This point causes even the professionals a great deal of trouble, as a result of which we find that names such as *Herpetopoma bella* and *Phenatoma rosea* have been erroneously ascribed the feminine gender but they have become so well established in usage that we may as well consider them to be correct. Even names such as *Argonauta*, which was masculine in Greek and Latin, have been quite justifiably assigned feminine gender as a genus name. I am aware of no other genus names in *-a* which have gender other than the feminine.

Genus names in *-us* are all masculine. I have so far found one obscure exception to

this rule.

Genus names in *-um* are all neuter. I am aware of no exception to this rule.

Genus names in *-e* are feminine. I have yet to find an exception to this rule. Latin nouns in *-e* are all neuter but Greek nouns in *-e* are all feminine and our genus names in *-e* would seem to be exclusively of Greek ancestry.

Rules for other endings can be given but they are more complicated and have more exceptions. I will give some of the more useful generalizations in future articles. However, the four rules given above cover the vast majority of cases. It will be noticed that the concord of gender between genus name and species name often results in rhyme, which is in itself of great mnemonic service. However, the endings of the noun and adjective do not always rhyme.

Some Practical Examples

A few practical examples involving changes of genus name will illustrate the points so far outlined. The recent demotion of our genus *Maurea* to subgeneric status provides many examples. *Maurea* is feminine but *Calliostoma* is one of the Greek neuter forms in *-ma*. Take note of the changes in the endings of the specific names. It can be seen that the subspecific names also agree with the gender of the genus name, not with the specific name. Note that only species names, which are adjectives, are subject to these changes.

Old name	New name
Maurea tigris tigris	*Calliostoma tigris tigris*
Maurea tigris chathamensis	*Calliostoma tigris chathamense*
Maurea pellucida pellucida	*Calliostoma pellucidum pellucidum*
Maurea pellucida spirata	*Calliostoma pellucidum spiratum*
Maurea pellucida haurakiensis	*Calliostoma pellucidum haurakiense*
Maurea pellucida forsteriana	*Calliostoma pellucidum forsterianum*
Maurea pellucida morioria	*Calliostoma pellucidum moriorium*
Maurea selecta	*Calliostoma selectum*
Maurea waikanae	*Calliostoma waikanae*
Maurea turnerarum	*Calliostoma turnerarum*
Maurea punctulata	*Calliostoma punctulatum*
Maurea benthicola	*Calliostoma benthicola*
Maurea osbornei	*Calliostoma osbornei*
Maurea multigemmata	*Calliostoma multigemmatum*
Maurea blacki	*Calliostoma blacki*
Maurea spectabilis	*Calliostoma spectabile*
Maurea foveauxana	*Calliostoma foveauxanum*
Maurea megaloprepes	*Calliostoma megaloprepes*

A number of the above names require comment. Notice that the word *tigris* does not change because it is a noun, meaning *tiger*. The second item in the list illustrates very clearly that only adjectives change their form according to the gender of the genus name. *Waikanae*, *turnerarum*, *osbornei* and *blacki* do not change, because they are noun forms. There is some uncertainty about *benthicola*. *Calliostoma benthicolum* would also be possible.

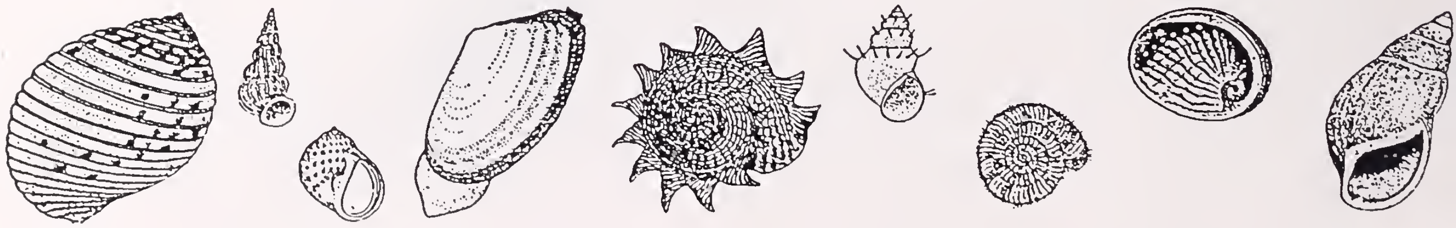
Usage vacillates between treating this word as a noun or an adjective but falls strongly in favour of its treatment as a noun. *Megaloprepes* is a rare type of adjective, which is pure Greek. The ending of the masculine and feminine form has a long vowel(Μεγαλοπρεπής, Megaloprepēs) but the neuter form has a short vowel(Μεγαλοπρεπές, Megaloprepĕs). Since we do not usually mark vowels with macrons and breves, except in dictionaries and grammar books, the distinction is lost.

The change from *Xenophalium* to *Semicassis* involves a change from neuter to feminine gender. Thus we had *Xenophalium labiatum* and *Xenophalium pyrum stadiale* but now we have *Semicassis labiata* and *Semicassis pyrum stadialis*. *Pyrum* does not change, because it is a noun meaning *pear*.

Readers of *Poirieria* will in recent months have seen the name *Paphies australe* in print. This is an error. The species used to be known as *Amphidesma australe* and was neuter. It should now be called *Paphies australis* and is feminine. The gender of the genus name *Paphies* is unambiguously marked as feminine in other species names such as *Paphies ventricosa* and *Paphies subtriangulata*.

A Few More Words of Advice

The topic discussed in this article is without doubt the most difficult subject, which we will be addressing in the entire series. However, it is certainly worth the effort of memorizing the three common patterns of adjective endings and the four rules about the gender of genus names as they will save much time and effort whenever a change of genus occurs. Learning the scientific species names cannot be done without effort but much can be done to make the task easier. The first two dozen names that you learn will be the most difficult. The more of them that you know, the easier it becomes to learn new ones, because you start to notice recurring patterns. Above all, it is necessary to use the names. If you get into the habit of using the scientific names to label and catalogue your specimens, you will find that the names of the commoner species will soon become very familiar. Don't be put of by the names when you see them in print. Take the time to read them out loud rather than skipping over them. Don't worry too much about the pronunciation as many different pronunciations are used for some of them. For example, most people pronounce the *c* in *Alcithoe* as an *s* but people who have studied classical Latin pronounce it as a *k*. Both pronunciations are acceptable. The important thing is to have a go and then you will soon start recognizing the names when you hear other conchologists using them and you will pick up the pronunciation in common use in your part of the world. As with any other task attitude is everything.



A WALE OUT OF WATER

Michael K. Eagle

Seasoned shell collectors still succumb to high-tide washups, no matter how mediocre they may be. Beach strand-lines vary in their abundance of seashells, usually determined not just by seasonal climate but by longshore current drift and mortality rates. My May '95 Welsh shell collecting was no different. Shell Island at Mochas, Llanbedar in North Wales exemplified deposits found there. Tenby, on Carmarthen Bay in South Wales, attracted many Victorian Shell collectors in the past and my visit was also fruitful. The Tenby Museum still showed a local range of shells even though the emphasis of modern European displays, including the Natural History Museum in London, had moved away from identification-based exhibits to those of a more ecological and environmental nature. Named reference collections of British shells abound behind-the-scenes of many museums, however, collections were invariably labelled with out-dated names and were poorly curated. It was unusual, though quaint, to see rust-stained signs on a stone wall at Tenby Beach warning visitors and locals alike : "WATCH YOUR STEP! RAZOR SHELLS". Conjoined valves up to 23 cm. of *Ensis siliqua* (common name: the Pod Razor), were common. The local limpet, *Patella vulgata* and the Purple Top Shell, *Gibbula umbilicalis,* were abundant on most rocks and the odd empty shell of the Flat Winkle, *Littorina littoralis* was present. Single valves of the thick trough shell *Spisula solida* and striped *Venus striatula* were plentiful.

At West Angle Bay, Dyfed, the thick top shell *Monodonta liniata* occured mid-shore, intertidally, on mud amongst weed. The Grooved Razor Shell *Solen margatus* also lived infaunally there and was often stained by the black mud that it lived in. An occasional *Turritella communis* was found washed inshore from its usual sub-tidal environment. Also "out of water" many of the common European cuttlefish *Sepia officinalis* were cast up, freshly dead, on the shoreline. Bleached "cuttlefish bone" littered the beach. Local residents informed me that a series of exceptionally harsh winters had taken its toll on inter-tidal mollusc populations.

The Conchological Society of Great Britain and Ireland operates a mapping scheme of both marine and non-marine molluscs and publishes species lists for the different marine areas. This is proving invaluable as human predation and interference along the shoreline, large areas occupied by marinas and docklands, off-shore dredging for gravel, anti-fouling paints, dredged spoil dumpings and industrial as well as domestic pollution, continue to contribute to molluscan decline. We can perhaps take a lesson from this exercise and pursue such a programme on a national basis, incorporating interested clubs and persons. In this way we might better monitor nearshore marine habitats integral to our interests. They are currently being observed in Great Britain to this end and in consideration of future nature reserve status.

MIOCENE FOSSIL MARINE MOLLUSCAN FAUNA FROM HAYS STREAM.

Michael K. Eagle.

Miocene marine fossil sites are not uncommon in the basal Waitemata beds around Auckland. Motutapu, Kawau, and Waiheke Islands have yielded their secrets, as have Parnell cliffs, the Waitakere Ranges and Muriwai. Known since 1905, Hays Stream (then called Slippery Creek) has produced a variety of interesting faunas including new species of corals. In March 1992, the writer, along with Dr Chris Hollis, and fellow members Nick de Carteret and Dr Bruce Hayward, fossicked at a new site within this locality (New Zealand Fossil Record site R12/f72).

The communities found here are greatly diversified and contain many fossil marine invertebrates in various states of preservation. Molluscs and brachiopods with their inherent ridged, well calcified skeletons have fossilised the best; other animals such as echinoderms and arthropods have disarticulated during transportation. Bryozoans and corals are preserved broken. Soft-bodied casts and ichnofossils have not survived the apparent downslope subaqueous mass flows. Shark teeth and teleost otoliths suggest a diverse necktonic fauna. At least four different communities from different depths appear to be mixed together. Extensive curation was required to "fix" most specimens so that they remained intact and thereby identifiable.

The site produced several new molluscan records and is rich in genera that live today in warm, subtropical waters at or beyond the northern extreme of the New Zealand Region. A large number of molluscan species first described by A.W.B.Powell and J.A.Bartrum from Waiheke Island prevail, perhaps indicating similar faunal communities. Eighteen families of Bivalvia and twenty-three families of gastropods are represented.

Like many New Zealand Cenozoic communities, the site is dominated numerically by a wide range of gastropods, the most abundant being the Turritellidae and Naticidae. *Limopsis* is the dominant bivalve and three Dentalliidae are common. The following are endemic to New Zealand, but are extinct:- *Lentipecten; Spissatella; Bartrumia; Kuia; Dosinia (Raina); Sarmaturbo; Zefallacia; Pareora; Austrofusus (Neocola); Zeacumina; Austrotoma;* and *Maudrillia.*

Found recent in subtropical waters and also found at Hays Stream are:- *Glycymeris (s.l.); Limopsis; Pteria; Isognomon; Chama; Eucrassatella (Siratus); Conus (s.l.); Conilithies; Gemmula;* and *Bathytoma (s.s.).* New or undescribed species of: *Mesopeplum; Chama; Austrovenus; Neilo; Paphies* and *Proerato,* were collected. Molluscan families collected but not already mentioned were:- *NUCLIDAE, NUCULANIDAE, LIMIDAE, GRAPHEIDAE, CARDITIDAE, CORBULIDAE, HIATELLIDAE, TROCHIDAE, CERITHIIDAE, STRUTHIOLARIIDAE, CALYPTRAEIDAE, NASSARIIDAE, MITRIDAE, OLIVIDAE, VOLUTIDAE, ACTEONIDAE, CYLICHNIDAE,* and *PYRAMIDELLIDAE.*

A new polychaete record, spines from Australasia's largest ever cidarid, barnacles, and an extensive list of coral species completes the list of fauna collected.

The fossils at Hays Stream are accessible in a roadside cutting with verge parking. The locality is sited on the Hunua Road R12/863566 (Fig.1), just a little east of Papakura.

FURTHER READING:

EAGLE, M.K. & HAYWARD, B.W.
1992 Paleontology and Paleoecology of Early Miocene Sequences in Hays and Tipakuri Streams, Northern Hunua Ranges, Auckland. *Records of the Auckland Institute and Museum* 29:113-133.

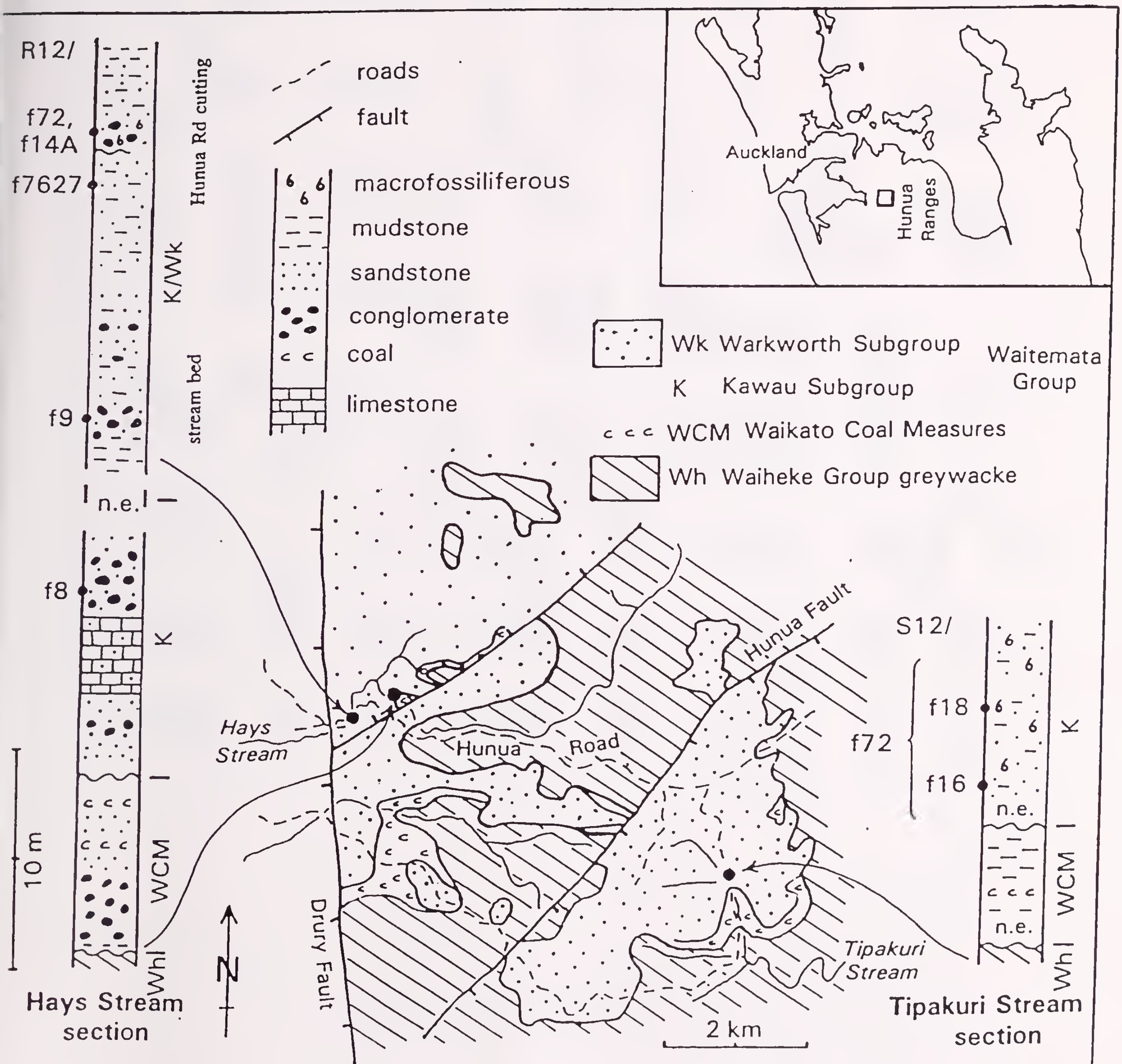
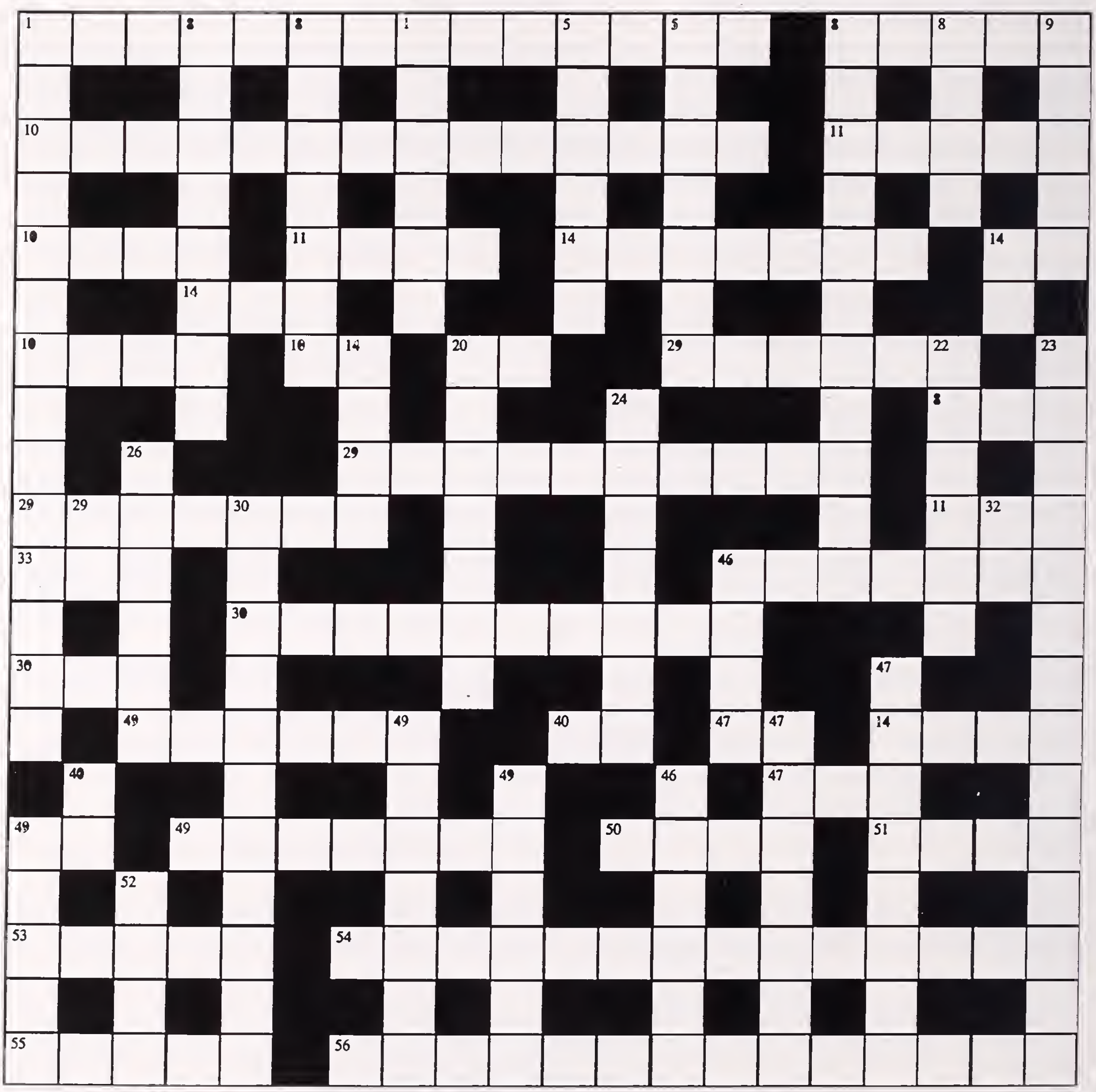


Fig. 1. Geological map of the northwestern Hunua Ranges (after Kear 1959 and Schofield 1976) showing the location of early Miocene stratigraphic columns for Hays and Tipakuri Streams; n.e. = not exposed.

(From Eagle & Hayward, 1992)

The Poirieria Crossword Number 1

This is the first Poirieria Crossword. It is intended to be a regular feature of the publication. This is a cryptic crossword and a fairly difficult one. The degree of difficulty will vary from one edition to another. There is a prize for the first correct entry received. This edition's prize will be a specimen of your choice from our box of "prize" shells. The closing date for the receipt of entries is 30 November 1995. Entries should be sent to the editor.



ACROSS

1. Pharaoh's Tour Co. metamorphoses into gastropod with no anterior tentacles(genus, see 56 across for species).
7. Nails up a gastropod?
10. Family of the escargot found in South African province turns out to be family of primitive Pacific Island landsnails.
11. Person instrumental in popularizing the tune *Waltzing Matilda*.
12. Reading the future with these cards, not with tea leaves a vegetable.
13. This needs to be hit on the head.
14. I rose on changes that destroy the land.

15. The French have a very definite word for this American city.
16. French king has appearance of indigenous edible plant(*Pteridium aquilinum esculentum*).
17. All-embracing prefix.
18. Legal officer who looks affirmatively Russian.
20. Extract logical operator from this ore.
21. Describes things in attics that move about and do not move.
25. Reconstructed object-oriented programming reveals a famous marine mammal.
27 & 6 down. Porous Colchian ran about to find a Brazilian landsnail.
28. This must put in place a geographical feature without tea.
31. Tailless *Evechinus chloroticus* knows its relatives.
33. First three parts of Jewish Law can lead to rocky peak.
34. This deadly fungal genus sounds anthropophagous.
35. Radix theory lacks nothing for this subgenus of landsnails known from only two islands in the Three Kings group.
36. Hebrew letter in holy orders?
38. Guarantee — cry of pain at losing part of holiday.
40. Bivalves with large, spoon-shaped processes loose their tails to yield a possessive pronoun.
41. Unit used to measure nothing but lots of it?
43. The Lido around a statue.
48. Sounds like Ivy, plus two, can reveal a girl's name.
49. Hiatus's redistribution engenders canine breed.
50. Rabbit's breeding ground also harbours bird of the family *Xenicidae*.
51. Build a shelter out of one bar.
53. Be ill over defamatory writing.
54. Fixed up albino odontoma for a common Indo-Pacific trochid.
55. Tease about a gastropod genus.
56. *Sulcata* in tin tube may metamorphose into species of slug (see 1 across for genus).

DOWN

1. Genus of small, narrow, elongated chitons with the valves not encroached upon by the girdle.
2. Work for voice and accompaniment about *Olea montana* and smallest letter of Greek alphabet.
3. I, Dorian, resolve into a kind of landsnail.
4. Artificial intelligence and numbers game reveal nudibranch genus.
5. Disturbing these marine gastropods can make them so evil.
6. **See 27 across.**
7. Species of *Diloma* with bright yellow margin to outer lip.
8. United Nations gets first-class medical report for Japanese ethnic minority.
9. Buddhist dignitary with nothing inside or a landsnail?
15. One Chinese mile looks like fifty more to Roman.
19. Arrange motor vehicles in curves.
20. Gastropod shape is transformation of sacred image and male swan.
22. Cook up gastropod with artificial intelligence.
23. Bombarding a *Tellina* with protons can produce gastropods of this genus.
24. This European herb sounds as if it has become detached.
26. This Arabian princess, who dances to a Norwegian tune, is transformed into a Pacific pinnid.
29. Looks, therefore, like an assembly of musicians.
30. Genus of EPITONIIDAE now named after authority of type species.
32. Data-processing pronoun.
34. Egyptian town that turns the wheels.
37. Lad in Taita produces species of *Penion*.
39. Move, thin out and cultivate this *Tellina*.
42. Authority of genus *Lamellaria*.
44. Celebrity's loss by five is important in the mensuration of circles.
45. Grouse about rough appearance.
46. Redevelopment of an area can produce landsnails of this species.
48. Pelecypod parts from old electronic devices.
52. Encourage crime about letter of Greek alphabet.

COMMENT

This letter and comment from the Editor is reprinted from "Hawaiian Shell News". The Editor's comment is particularly relevant in relation to the series of articles written by Frank Boulton, the first of which is published in this edition.

SHELLETTERS

FOGGIA, ITALY

With reference to my article "Some notes on a proper use of scientific names in Volutidae" (HSN March 1995), I have further comments.

1) I had no intention to violate any of the articles of the International Code of Zoological Nomenclature (ICZN).

2) It is possible that the doubling of the ending "i" is a result of an incorrect subsequent spelling but, in my opinion, it gives rise to an unpleasant sound: in *Lyria <u>beauii</u>* there are 5 vowels together!

4) As to agreement noun-adjective, I pointed out that:

(a) *Lyria kuniene* (female-neuter) should be written *Lyria kuniensis* (female-female).

(b) *Provocator palliata* (masculine-feminine) should be written *Provocator palliatus* (masculine-masculine).

(c) *Cymbium senegalensis* (neuter-masculine) should be written *Cymbium senegalense* (neuter-neuter).

Are these statements incorrect?

5) In my opinion, the agreement noun-adjective has to be attentively considered whenever <u>a new species</u> is named. Furthermore, when a species is included in a different genus [from that in which it was originally described], I cannot understand why the specific name doesn't change consequently.

Dr. Michele Dardano
Via Petrarca 43, 71100, Foggia, Italy.

[The ICZN agrees with Dr. Dardano. Article 34(b) states, "The termination of a Latin or latinized adjectival or participial species-group name must agree in gender with the generic name with which it is at any time combined; if the termination is incorrect it must be changed accordingly (the author and date of the species-group name remain unchanged. TB]

AUCKLAND MUSEUM PUBLICATIONS 1994

DE CARTERET, N. 1994. The genus *Oliva* from Mele Bay, Vanuatu. *World Shells* 8: 40-42.

DE CARTERET, N. 1994. Sand dwelling cones from Mele Bay, Vanuatu. *World Shells* 9: 52-54.

DE CARTERET, N. 1994. Rarities continue to come from the Solomon Islands. *World Shells* 10: 70-71.

HAYWARD, B.W. and BROOK, F.J. 1994. Foraminiferal paleoecology and initial subsidence of the early Miocene Waitemata Basin. Waiheke Island, Auckland. *New Zealand Journal of Geology and Geophysics* 37: 11-24.

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HAYWARD, B.W. and TRIGGS. C.M. 1994. Computer analysis of benthic foraminiferal associations in a tidal New Zealand inlet. *Journal of Micropaleontology* 13(2): 103-117.

ISAAC, M.J., HERZER, R.H., BROOK, F.J. and HAYWARD, B.W. 1994. Cretaceous and Cenozoic sedimentary basins of Northland, New Zealand. *Institute of Geological and Nuclear Sciences Monograph* 8, 203p.

POIRIERA

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CONTENTS:

"**Poirieria**" welcomes contributions on suitable topics, typed or on disc if possible, but neatly handwritten articles are also welcome. Please send to: The Editor, Glenys Stace, Auckland Institute and Museum, Private Bag 92018, Auckland, New Zealand. Contributions on disc or printed on a wordprocessor should use CG Times (Wordperfect) or Times New Roman (Word 5), 12pt, with titles 16pt bold and author 14pt bold. Your co-operation will help keep the appearance of our Journal consistent.

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Some back numbers of "**Poirieria**" are available.
Please send all changes of address, queries on distribution of "Poirieria", and reciprocal material to: Nancy Smith, 4 Kallista Place, Brown's Bay, Auckland 1310 New Zealand.
All other correspondence should go to: The Secretary, Mrs M. Town, 9 Otakau Rd. Milford, Auckland 9, New Zealand.

"**Poirieria**" does not intentionally carry original descriptions of species or genera and does not wish to be cited as authority for new taxa.

EDITORIAL: Some Major Changes.

This volume of Poirieria marks major changes. The publication of "The Marine Fauna of New Zealand: Index to the Fauna 3. Mollusca" by Hamish G. Spencer and Richard C. Willan is a landmark. Powell's "Mollusca of New Zealand" (1979), has been the major reference publication for almost twenty years. Updating taxonomy has been difficult, especially for amateurs, who do not have ready access to the many and varied scientific papers which increasingly appear in overseas publications. In the intervening years many species have changed genera, been synonymised or new ones discovered. In general, contributors to Poirieria have followed Powell (1979), except where an article specifically refers to new or changed taxonomy.

The species lists of the two major articles in this volume have been updated to Spencer & Willan (1995). From the publication of this volume, that will be editorial policy.

The National Institute of Water and Atmospheric Research Ltd. is to be congratulated on the publication of this scholarly work. The checklist with its index would stand alone, but the addition of the extensive bibliographies provides an invaluable aid to further research. The essential cross referencing of the checklist to page numbers in Powell (1979), to which one must still refer for illustration and description, is faithfully and accurately persued. I do not wish to detract in any way from the scholarship of this work, but from the point of view of someone who uses it daily, I find the positioning of the checklist index in the middle of the book, awkward and entries and page numbers in the index occasionally inaccurate.

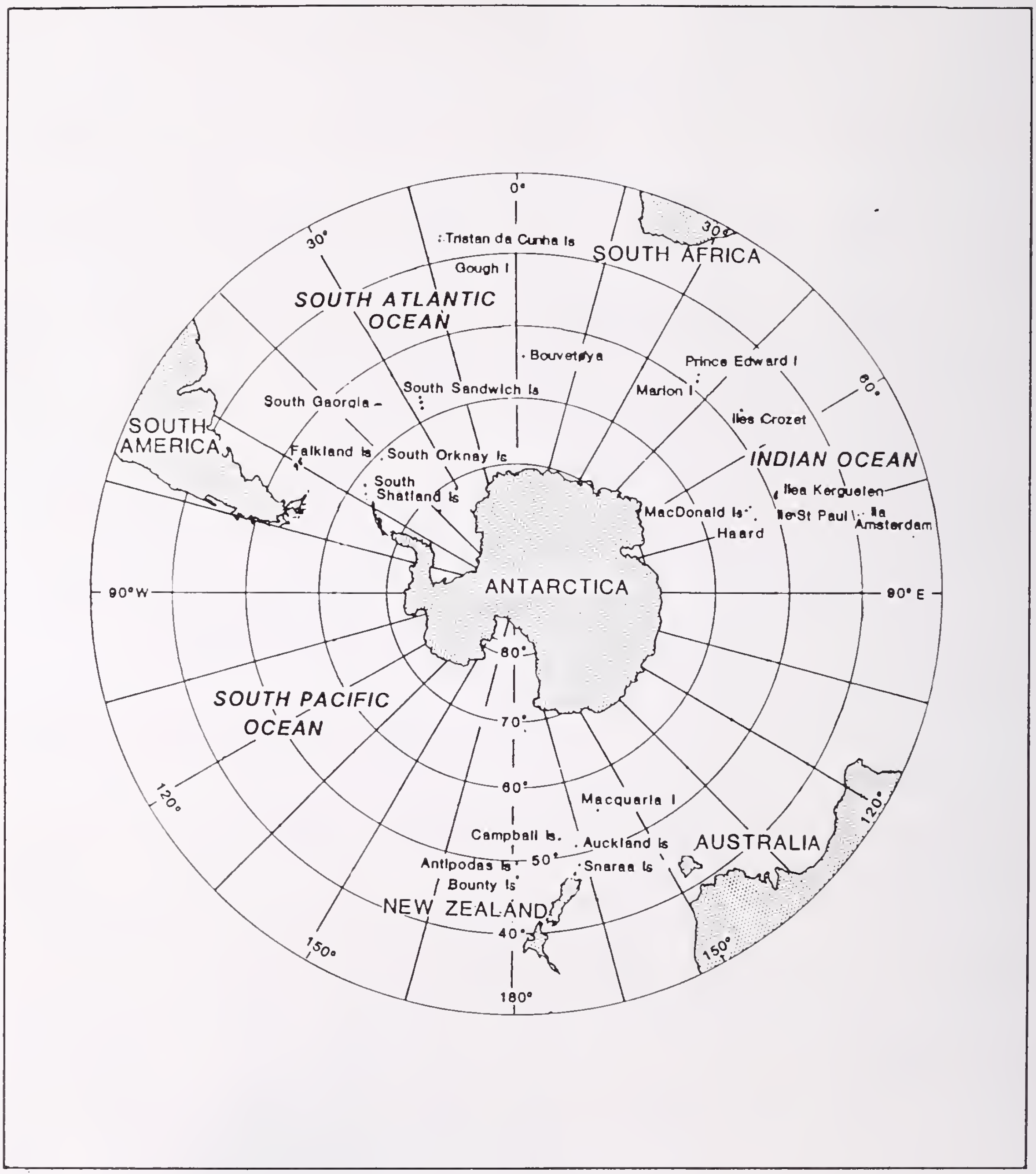
Another major change is to Poirieria itself. The system we have used to date, of Volume and Number is discontinued. It was instituted when six editions of Poirieria were published per year and was appropriate for a publication of that frequency. It has been outdated for some time.

This Volume is the first using a new system. As we were using Volume 17 for the last issue, this one has become Volume 18, June 1996. The next one will be Volume 19, October 1996. With each edition taking a new Volume number, followed by the date, less confusion should result especially as no set publication dates can be predetermined.

Poirieria welcomes contributions from members, overseas members and non-members. Articles are not subject to peer review, but the Editor reserves the right to elicit comment from collegues and to make editorial changes with the approval of the author. It is editorial policy to publish articles on a wide range of subjects of interest to youth, amateurs and professionals. What Poirieria contains and the frequency of publication depends on YOU!

The third major change is the decision of the committee to allow advertising in Poirieria. Rates will be reasonable and the content is to have some relevance to the nature of the Journal. Please contact the Editor if you wish to take advantage of this offer.

Fig. 1 The Subantarctic Islands



After "New Zealand's Subantarctic Islands" Department of Conservation 1991

MARINE MOLLUSCS OF THE AUCKLAND AND SNARES ISLANDS, SOUTHERN NEW ZEALAND, JANUARY 1995

by Margaret S. Morley

SUMMARY

A total of 139 species of marine molluscs is recorded from the intertidal and shallow subtidal for the Auckland and Snares Islands in the Subantarctic. This paper reports an extension of range for one chiton, 37 gastropods and eight bivalves. A complete species list is included.

INTRODUCTION

During January 7-13 1995 Southern Heritage Expeditions sailed a chartered Russian boat, "M.V. Academik Sholaski" from Bluff, Invercargill to the Auckland and Snares Islands (Fig. 1). Included in the passengers were eight experienced SCUBA divers, the first large group to visit the Subantarctic. Because I had collected intertidal molluscs there in 1993 Rodney Russ, Director of Southern Heritage Expeditions, wrote prior to the trip offering to post me some benthic samples taken by the divers. Following my instincts and backed by some sound advice I declined his generous offer but booked a place for myself instead!

This trip was less stressful than the one in 1993 because the boat was larger and more stable. The swells did reach 8 m in height but we were also fortunate to enjoy several days of atypical calm weather. We also sailed a shorter distance because Campbell Island was not included.

The task of curating the material on board, although demanding, was less traumatic than previously because there was more space. However I was too busy to wonder why my cabin mate rushed away whenever I got the formalin out!

Powell (1979), Marshall (1995) and Morley (1994) are used as references when commenting on extension of range. Nomenclature follows Spenser and Willan (1995).

Representative specimens are housed in the Auckland Museum. (Catalog numbers prefixed by AK)

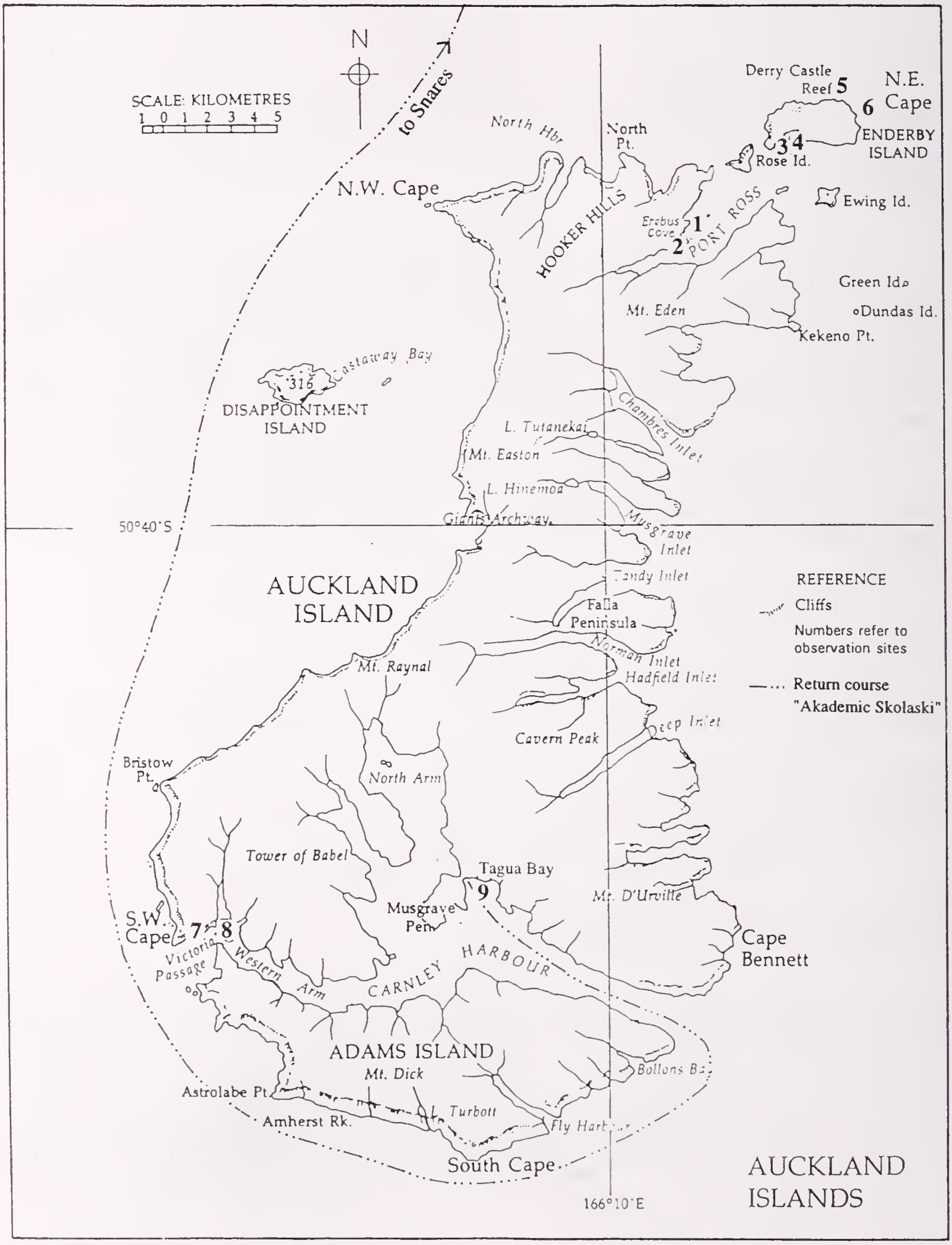
OBSERVATION SITES AUCKLAND ISLANDS (Fig. 2)

1. Erebus Cove, Auckland Island - SCUBA

The M.V. "Akademic Scholaski" arrived at Erebus Cove at 7 pm after a relatively easy passage from Bluff of 30 hours. The divers did a shakedown dive on the seaward side of Davis Island just offshore in depths to 12.5 m. Living exposed on the surface of the sandy bottom were bivalves up to 42 mm in length. At first, because of their size, I thought these were a *Dosinia* species, but later identified them as *Tawera bollonsi* (see Discussion). These could be the first live taken specimens of this species. The type specimens are single valves dredged in Carnley Harbour. It was not possible to say whether these specimens always lie exposed on the sea floor or whether, as seemed more likely, they had been scoured out by the strong current reported by the divers.

The divers also found the chiton *Plaxiphora aurata*, gastropods *Cantharidus capillaceus capillaceus*, *Actinoleuca campbelli campbelli, Eatoniella roseola*, *Thoristella chathamensis chathamensis* and the bivalves *Lissarca aucklandica* and *Ruditapes largillierti*.

Fig. 2 Auckland Islands - Observation sites numbered.



After "Beyond The Roaring Forties," Conon Fraser 1985

2. Erebus Cove, Auckland Island - Snorkel

While the divers were exploring I went for a snorkel off the beach. The chiton *Onithochiton neglectus subantarcticus* was common under rocks down to 3 m.

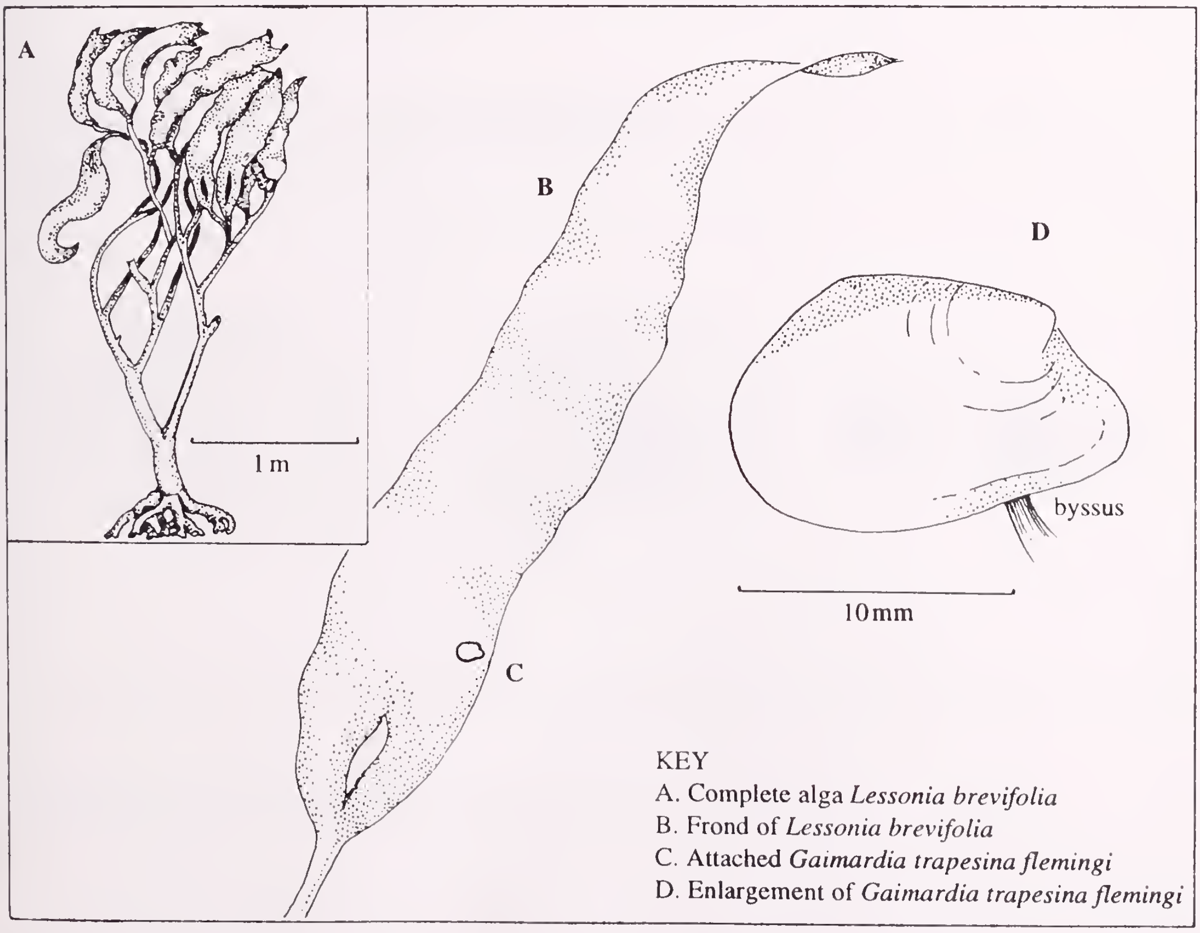
3. Sandy Bay, Enderby Island - SCUBA

The divers went to a depth of 18 m off the rocky point at the western end of Sandy Bay. Ingrid Visser, the divemaster, and Andrew Penniket noticed several pale bivalves attached by byssal threads to the alga *Lessonia brevifolia* at depths between 12 and 18 m. The byssus was so strong that the thin shell was crushed when it was pulled off. These specimens have subsequently been identified as *Gaimardia trapesina flemingi*, and are the first living specimens observed (Fig. 3). Andrew has them recorded on video tape. Powell (1979) described the type specimens as "common in beach drift opposite Rose Island".

A second highlight of the dive was the observation of several large white nudibranchs. Unfortunately I was not aboard when the specimens were brought up and they did not preserve well enough for positive identification. They were possibly *Atagema carinata* but this requires confirmation.

The micromollusc grazer *Eatoniella notalabia* was found on algae during the Sandy Bay dive. This species has not previously been recorded from any of the Subantarctic Islands.

Fig. 3 Gaimardiidae *Gaimardia trapesina flemingi* Powell, 1955.



4. Sandy Bay, Enderby Island - Intertidal

While waiting for my return trip in the zodiac, I found many specimens of *Margarella antipoda (see Discussion).*

5. Derry Castle Reef, Enderby Island - Intertidal (Fig. 4)

I walked across the moors among nesting Royal Albatross (*Diomedea epomophora)* and around the coast of Enderby Island. In 1993 the Department of Conservation laid 1080 poison to kill the high population of rabbits. This has been 100% successful. The poison also killed the mice which had not been anticipated. The removal of both these introduced species has had two effects. First on the grass, liverworts and megaherbs which are showing signs of recovery; and second on the adult Skua (*Stercorarius skua lonnbergi)* population which died due to eating poisoned rabbits and mice. The current skua are all young birds and not breeding yet. It is thought that either the younger birds were away during the 1080 drop or they have since moved in from surrounding islands to fill the vacant territory.

The walk was in bright sun with a temperature up to 18°C. The extensive intertidal platform at Derry Castle Reef again proved to be an area of rich diversity and produced a total of 98 species, including 55 not found in this location in 1993. Of these the tiny gastropods *Scissurella fairchildi* had only been recorded previously in 300 m off the Bounty Islands, *Sinezona laqueus* was not known south of the Snares, and *Terelimella benthicola* was only known by the type specimen dredged off eastern Otago in 474-637 m. I also have a specimen taken from anchor mud at a depth of 7 m in Port Pegasus, Stewart Island.

Fig. 4 Megaherbs, *Anisotome latifolia* on northern coast of Enderby Island, near Derry Castle Reef.

The pyramidellid *Odostomia incidata* had not been recorded south of Otago Heads. The bivalves *Cyamiomactra problematicum, Lissarca harrisonae* and *Kellia cycladiformis* found at Derry Castle Reef are an extension of range for these species. The large siphon limpets *Benhamina obliquata* were laying creamy yellow spiral spawn masses on high tidal rocks (Fig. 5). The micromollusc *Orbitestella hinemoa* (Fig. 6), was found alive in gravel recording an extension of range.

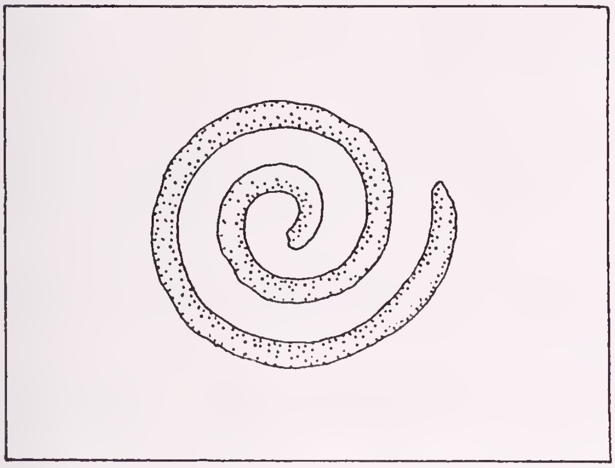
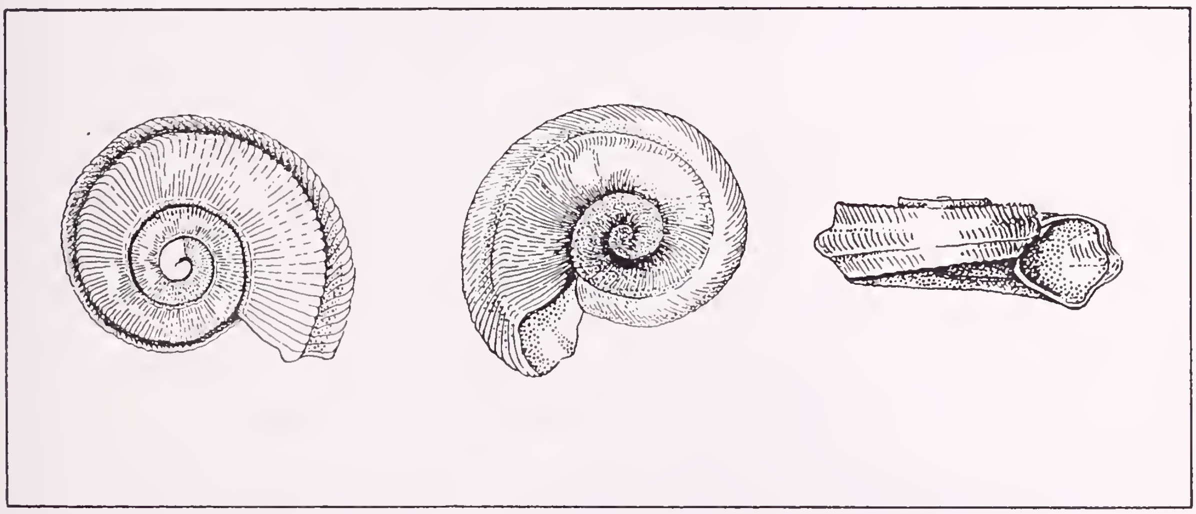


Fig. 5 Siphonariidae spawn mass of *Benhamina obliquata* (Sowerby, 1825).
Location: Derry Castle Reef, Enderby Island, high tidal boulders. Drawn actual size .

Fig. 6 Orbitestellidae *Orbitestella hinemoa* Mestayer,1919
Location: Derry Castle Reef, Enderby Island, shell sand
Size: Height 0.3mm. Width 0.9mm.



6. North East Coast, Enderby Island - Wash up

On a rocky headland on the north coast of Enderby Island, after a risky confrontation with territorial Hooker's Sealions (*Phocarctos hookeri),* I collected a number of the large pink trochid *Calliostoma spectabile*. To my surprise this species was not found at any of the various dive sites.

7. South West Cape, Victoria Passage, Auckland Island - Intertidal (Fig. 7)

We were warned that the walk to the top of South West Cape in the Western Arm of Carnley Harbour was tough because there was no track, and the ascent was steep to 300 m through boggy peat, scrub and tussock. We were motivated by spectacular views both down and along the sheer basalt cliffs on the west coast, nesting Wandering Albatross *(Diomedea exulans)* on the plateau and Shy Mollymawks (*Diomedea cauta)* nesting among megaherbs on the cliff ledges. After the climb to the top we were certainly enthralled with the unique lunch stop. We sat in tussock with the promised views and listened to the wind humming through the flight feathers of watchful albatross as they buzzed the group. The call of the Sooty Albatross *(Phoebetria palpebrata)* was very evocative.

A bonus to me was the start of the walk along a boulder shore 400 m north of Breaksea Point (Fig. 2). Molluscs such as the large limpet *Cellana strigilis strigilis* and the top shell *Cantharidus capillaceus capillaceus* were common, but in one high tide rock pool I spotted a live *Calliostoma spectabile.* I was still puzzling about this unlikely find when dozens of freshly dead shells of the small, endemic paua *Haliotis virginea huttoni*, the limpet *Cellana strigilis strigilis* and *Cantharidus capillaceus capillaceus* were seen scattered, not on the beach, but along a grassy platform 3 m above the high tide mark. The Department of Conservation ranger, Pete McClelland, suggested that birds, most likely shags, had learned to dive and stab off the shells then bring them up to extract the animal. The *Calliostoma spectabile* was perhaps brought up to be consumed then accidentally dropped and lost amongst algae in the pool.

Vast numbers of the top shells *Diloma nigerrima* were feeding on the stranded straps of the bull kelp *Durvillaea antarctica.*

The botanists were especially delighted with the glowing clumps of flowering purple gentians (*Gentiana cerina)* beading the lower slopes.

Fig. 7 Victoria Passage shoreline, looking South to Carnley Harbour, Auckland Island.

8. Godley Valley, Carnley Harbour, Auckland Island - SCUBA

While some of us had been puffing up South West Cape, the divers had explored the wreck of the "Grafton" driven ashore in 1864. The five crew members were stranded for eighteen months. Later in the day the divers did a second dive off the entrance to Godley Valley to a depth of 10 m.

Some of the molluscs brought up included a live specimen of the micromollusc *Eatoniella perforata*. This confirms the extension of range for this species, a dead specimen was found at Derry Castle Reef in 1993. The gastropods *Caecum digitulum* and *Liotella polypleura* had been recorded from the Snares and Bounty Islands, but not the Auckland Islands. However although Powell (1933) recorded *Caecum digitulum* from the Bounty Islands, this location is not included in Powell (1979). *Melanella otakauica* had only been recorded from off eastern Otago in 470-640 m. The identification of *Eatoniella bathami* was decided by comparision with the holotype (AK 71250) and paratypes (AK 72808) and is an extension of range for this species.

Some juvenile chitons were found in algal washes and shell sand. Studies show that juvenile chitons can differ from adults of the same species (O'Neill 1984), therefore it seems unwise to attempt to identify these to species level (see Species list).

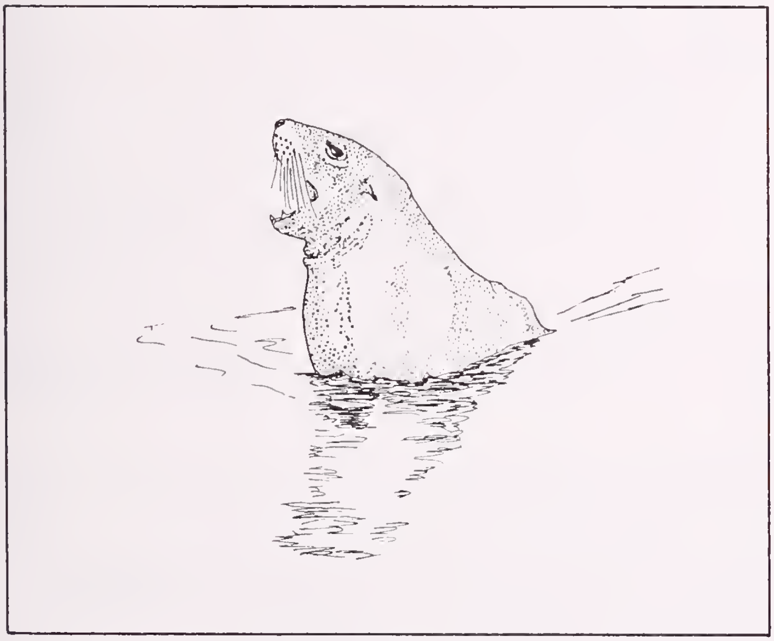


Fig. 8 Resident sealion at Tagua Bay.

9. Tagua Bay, Carnley Harbour, Auckland Island - Intertidal

Time was running out and in his efforts to please his passengers Rodney ferried the keen ones ashore by zodiac at five in the morning. While the rest of the group walked to see the remnants of the coast watchers hut and lookout station, I remained on the beach under the watchful eye of the resident sealion (Fig. 8). His timing was impeccable, each time I became engrossed in turning stones at the low water mark he would rush out of the water and attack! Otherwise it was a very calm morning, the surface of the bay with it's halo of dark bush reflected the pale pink bands of sunrise. Numerous tui were feasting on the swarms of flies and midges, dashing and diving in the manner of fantail acrobatics that we see in the north. Molluscs collected at this location had all been found in 1993.

Journey from Auckland Island to the Snares (Fig. 2)

After leaving Tagua Bay we ate a belated breakfast while the "Akademic Skolaski" sailed out of Carnley Harbour through dense flocks of petrels. The rising sun highlighted a zone of white lichen just above sea level. Previous tourist boats have set a course north along the more sheltered east coast of Auckland Island. On this occasion the perfect weather allowed a course following the south coast of Adams Island and the west side of Auckland Island.

The mild sunny day encouraged passengers and crew up on deck to appreciate the imposing, rugged basalt cliffs rising to 500 m. In places the horizontal layering clearly showing the successive strata of lava flows. The continuous swells powered by the prevailing westerlies erode the cliffs several metres each year. We were told tales of 19th century shipwrecks such as the sailing vessel the "General Grant".

During the morning an ominous low bank of cloud developed on the horizon. At midday the ship sailed instantly from sun into silent, dense fog. This is caused by warm air of the high pressure system spiraling down and being cooled quickly to dew point by the cold surface of the sea (G. Telford, pers. comm.). Further north, the mist cleared intermittently to reveal brief glimpses of the sheer cliffs on the west side of Disappointment Island.

10. Ho Ho Bay, east coast, Snares Island - Snorkel (Fig. 9)

Early the following day we were taken close to shore in zodiacs to view, snorkel or dive. My most vivid memories of the Snares' snorkel are not of molluscs, but sealions! Two came rotating in at top speed to investigate my buddy and me, only swerving away within a hand's-breadth of my mask at the very last moment when a collision seemed inevitable (Fig. 10). The four of us played in the stream of bubbles coming up from the divers below. Soon bored with two slow snorkellers the sealions effortlessly spiralled down to buzz the divers 20 m below. We could watch them all the way. The bubbles came up rather explosively for a while! Although there are reports of divers' fins being bitten, sealions appear to pose no threat in the water in sharp contrast to their serious aggression on the land.

Also accompanying us on the snorkel were flocks of Snares Crested Penguins (*Eudyptes robustus)* showing their superb "flying" skills underwater. They even quarrel under water!

Steep cliffs continued underwater at an angle of 50°. The rock faces were brightly coloured gardens, thickly bedded with green and red algae and kelp down to 20 m. As at other sites, I took samples of algae to process for micromolluscs. Partly hidden were the large chitons *Plaxiphora aurata*, and large flat limpets *Patelloida corticata* up to a length of 19.5 mm, both these species are new records for the Snares. Eight other species found at the Snares are also extensions of range (see Species List).

As well as molluscs, the divers brought up specimens of the starfish *Allostichaster insignis* and *Calasterias suteri* (see Fiona Thompson's article).

11. Ho Ho Bay, Snares Island - SCUBA

The divers brought up some exciting molluscs. On the sandy floor of Charlotte Webb's cave at 27 m. Ingrid found the large pale buccinid *Cominella nassoides nassoides* alive. A Silver Paua *Haliotis australis* and a top shell *Calliostoma granti* were found in 20 m. Some of these species are new records for the Snares.

Even the divers who had worn dry suits were glad to get back on the "Akademic Skolaski" for hot showers, but we all agreed that our close encounters with sealions and penguins were a thrilling end to the trip. The shining eyes told it all.

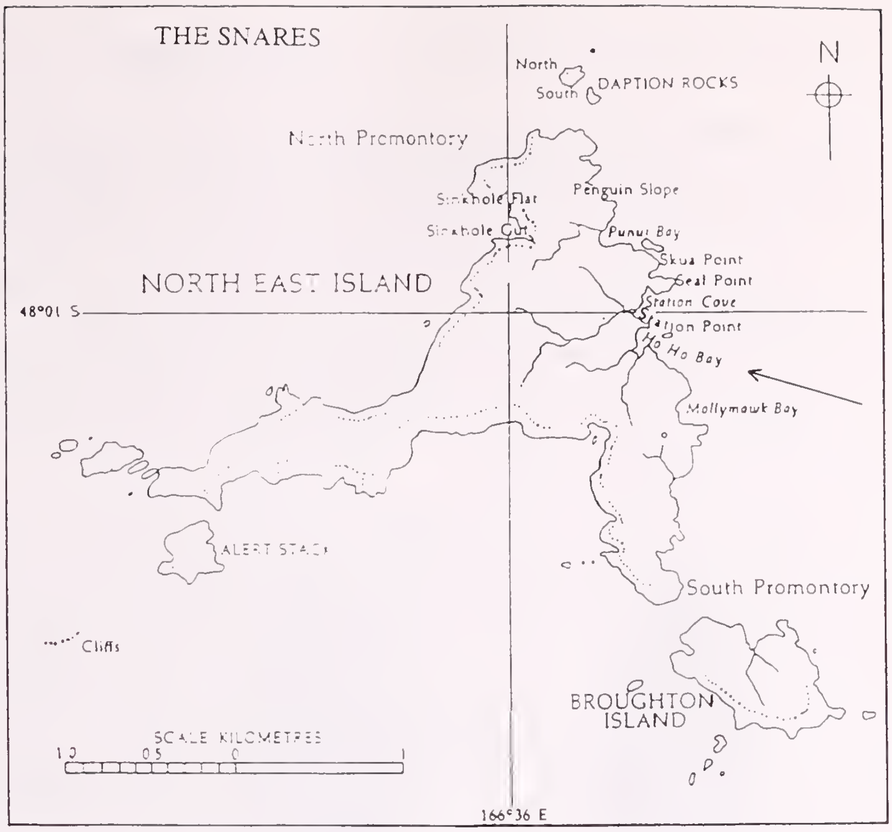


Fig. 9 Snorkel and dive site Ho Ho Bay, The Snares.

Fig. 10 Close Encounters at the Snares.

A. Endemic limpet, *Cellana strigilis flemingi*
B. Limpet *Patelloida corticata*
C. Chiton *Plaxiphora aurata*
D. Red and green algae
E. Snares Crested Penguins, *Euduptes robustus*
F. Hooker's Sealion *Photocartos hookeri*

DISCUSSION

1. *Leptochiton* cf. *subantarcticus* (Iredale and Hull, 1930) (Fig. 11) (AK 130697)

A creamy white chiton 4.38 mm long and 2.35 mm wide was found in gravel taken by divers in 10 m at Godley Valley in Carnley Harbour. The holotype is known only by a single intermediate valve dredged off the Auckland Islands in a depth of 171 m. Diagrams show the valve to be highly arched and evenly rounded (Kaas and Van Belle, 1985).

Specimen examined:

Leptochiton subantarcticus (AK 99771) This specimen was dredged in 499-540 m in Papanui Canyon, off Otago Heads. It is dried and curled with an approximate length of 7 mm and width 3 mm.

Comparision of features:

a) Girdle: Both the Papanui Canyon specimen and my specimen have small scales. My specimen also has a hairy margin.

b) Valves: Both specimens have a similiar sculture of fine, round, flattened pustules arranged in longitudinal rows; the lateral areas are only slightly raised and have distinct white concentric lines. The main difference is that the valves of the Papanui Canyon specimen are considerably higher arched than my specimen. Is there a possibility that this feature develops during growth or is determined by the deeper habitat?

In the diagram of the type valve the sculpture is shown as square to oblong pustules arranged in rows whereas the pustules on the Papanui Canyon and my specimen are round.

Summary:

A series of adult specimens from the shallower waters of the Subantarctic need to be found and examined to answer questions and decide on identification.

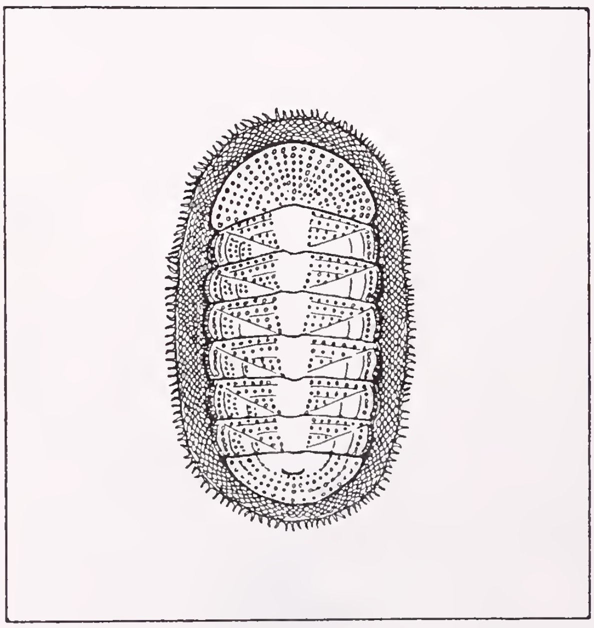


Fig. 11 Lepidopleuridae *Leptochiton* cf. *subantarcticus* (Iredale and Hull, 1930).
Location Entrance to Godley Valley, Carnley Harbour, Auckland Island, SCUBA, 10m.
Size Length 4.38mm. Width 2.35mm.

2. *Onithochiton neglectus subantarcticus* Suter, 1907 (Figs. 12, 13)

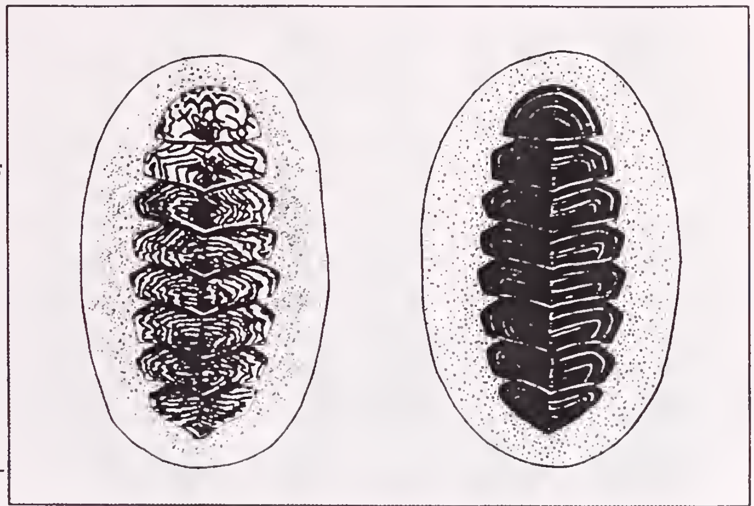
Powell (1979) gave specimens of *O. neglectus* found in algal holdfasts the subspecific name *opiniosus.* This was synonymized by O'Neill (1985). Near Breaksea Point I collected nine specimens of *O. neglectus subantarcticus* living in washed up holdfasts of kelp, *Durvillaea antarctica.* On comparision with nine specimens found living under stones in sites around Carnley Harbour, I could not see any distinguishing features, all were long and narrow

and had shell eyes (aesthetes) although these were less well developed in the specimens, especially the adults, that were found in the holdfasts.

The colour of the valves varied from uniformly dark brown to concentric diffuse bands of brown and white. In common with other molluscs the surface of the chiton valves is eroded in some specimens. This is particularly noticable around the shell eyes. The girdles are pale buff with very fine spicules.

O'Neill, (1985) stated that *Onithochiton neglectus subantarcticus* has not yet been recorded subtidally. In 1993 I found this species in 1-3 m under stones while snorkelling at Erebus Cove and also at the Meteorological station on Campbell Island. In 1995 divers found it down to 18 m off Sandy Bay, Enderby Island. At Victoria Passage, Carnley Harbour it was living at extreme low tidal level on rock among *Durvillaea subantarctica.*

Fig. 12 Chitonidae *Onithochiton neglectus subantarcticus* Suter,1907.
Location Derry Castle Reef, Enderby Is Auckland Islands.
Size Length 37.8mm. Width 18.9mm.



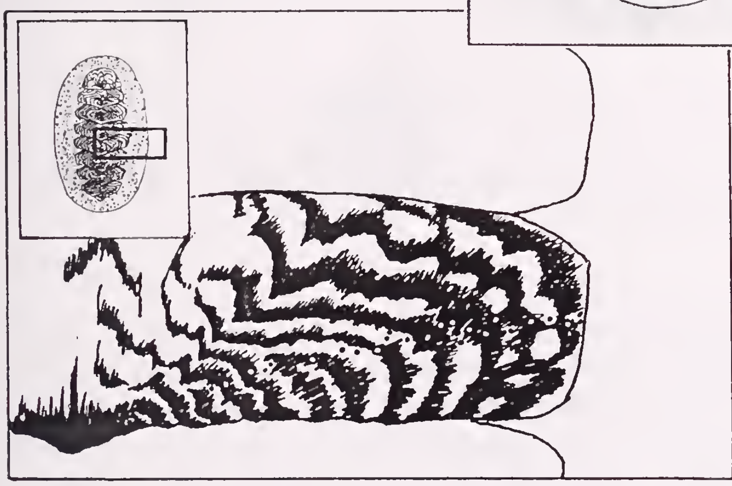


Fig. 13 Enlargement of part of a valve of *Onithochiton neglectus subantarcticus* to show pattern details and shell eyes.

3. *Calliostoma (Maurea) tigris* (Gmelin, 1791)

The divers did not find any *Calliostoma tigris* to confirm the presence of this species reported by a diver on a previous trip (I. Scott, pers. comm.).

4. ? *Cirsonella* aff. *parvula* Powell, 1926 (Fig. 14) (AK 130563)

The type locality of this species is 97 km east of Lyttelton in 183 m and it has not previously been recorded from elsewhere. A freshly dead specimen was found in shell sand at Derry Castle Reef, Enderby Island.

Specimen examined: *C. parvula* paratype (AK 72336)

Unfortunately the paratype is damaged on the spire and aperture and the surface is also affected by "glass disease". The original colour cannot be determined.

The two specimens are similiar in shape. In Powell's original illustration (1926) the spire is higher than that of my specimen. The aperture of my specimen is circular with distinct sinuations at the base and periphery. These were not shown in Powell's illustration or mentioned in the description. My specimen is white with no sign of the light brown in fresh specimens described by Powell. *C. parvula* is not illustrated in Powell (1979). The identification of the Derry Castle specimen is doubtful and requires further study.
(B. Marshall, pers. comm.)

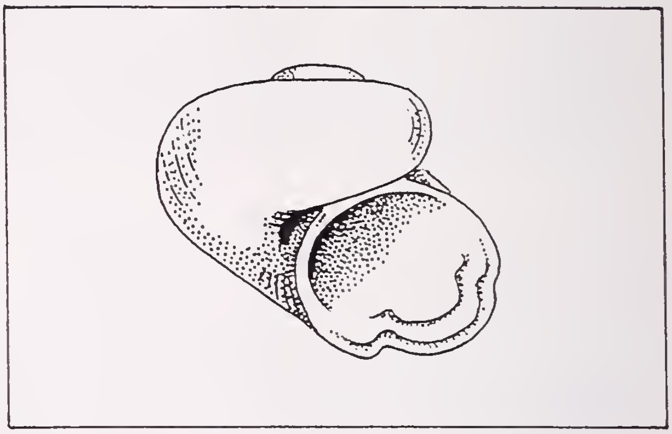


Fig. 14 Skeneidae *Cirsonella* aff. *parvula* ? Powell, 1926.
Location Derry Castle Reef, Enderby Island,
Size Height 0.71mm. Width 0.99mm.

5. *Eatoniella (Dandanula)* aff. *minutocrassa* Ponder, 1965 (AK 130564)

A single dead specimen was found in washed up shell sand at Derry Castle Reef, Enderby Island, Auckland Islands. It's features match Ponder's description. There are 19 paratypes in the Auckland Museum collection, (AK 72826); the holotype (AK 71261) was not found in 1993. My specimen matches the mature paratype specimens but it's identification is in doubt because it is much larger, with a height of 1.42 mm. The mature paratypes measure only 0.92 mm in height.

6. *Eatoniella* aff. *puniceomacer* Ponder, 1965 (AK 130562)

The specimen collected at Derry Castle Reef, Enderby Island, has a larger umbilicus and aperture than that described by Ponder. The geographic range for *E. puniceomacer* Powell (1979) is the northeast coast of the North Island.

7. *Margarella antipoda rosea* (Hutton, 1873)

In 1993 I found a single specimen of *Margarella antipoda* alive in a washed up holdfast at Derry Castle Reef, which I identified as *M. antipoda rosea.* On this second trip I found over 80 specimens living under holdfasts of the giant kelp *Durvillaea antarctica* on an intertidal platform at Sandy Bay. Numerous typical *M. antipoda antipoda* are found living close by on low tidal rocks and algae. Since by definition two subspecies cannot live in the same place, my identification of *M. antipoda rosea* cannot stand. My observations show however that forms identical to these two subspecies do occur in different habitats in close proximity in the Auckland Islands. Does this mean that the two subspecies should be synonymized or maybe they should be recognised as two distinct species in their own right?

8. *Melanochlamys* sp. (AK 130441)

A translucent white opisthobranch slug *Melanochlamys* sp. in the family Aglajidae was found during the Sandy Bay, Enderby Island dive at a depth of 18 m. Further specimens will be needed both for photographs and dissection in order to determine the species. This genus has not previously been recorded from the Subantarctic. Presently there are two species recorded from New Zealand, *Melanochlamys virgo* and *M. lorrainae,* both essentially restricted to the North Island and one third the size of my specimen (R. C. Willan pers. comm.).

9. *Onoba* spp.

Onoba species were common in algal washes. Despite much comparision and counting of spiral cords I am still doubtful of my identifications to species level.

10. *Rissoella* Gray, 1850

In 1993, *Rissoella (Jeffreysiella) rissoaformis* was found from algal washes at Derry Castle Reef, Enderby Island, Auckland Island. On this trip this species was found again at this site and also at Erebus Cove, Auckland Island. In addition *R. rissoaformis* was alive in algae taken while snorkelling at the Snares. This species had not been recorded from the Snares previously.

At Derry Castle Reef, *R. flemingi* (Fig. 15) was found in intertidal algal washes. The specimen is purplish brown fading to pale pinkish purple around the aperture. The operculum is dark brown. *R. micra* (Fig. 16) was found dead in shell sand. The shell is transparent buff. This is an extension of range for both these species.

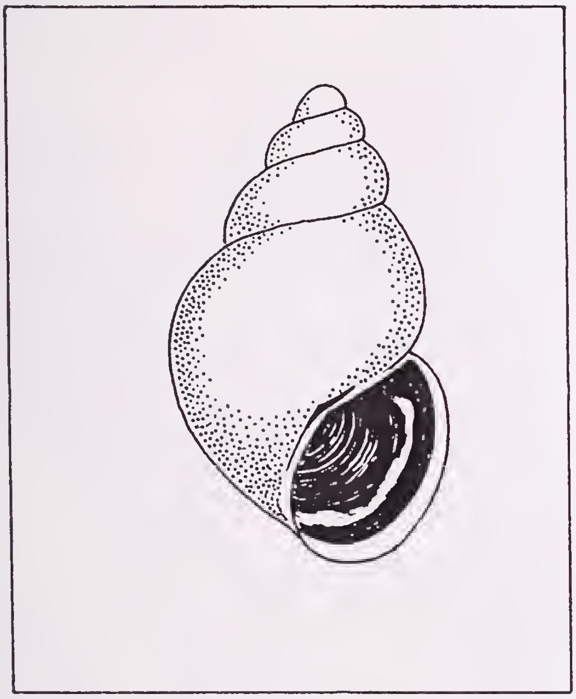


Fig. 15 Rissoellidae *Rissoella flemingi* Ponder, 1968
Location Derry Castle Reef, Enderby Island, algal wash
Size Height 2.54mm. Width 1.42mm.

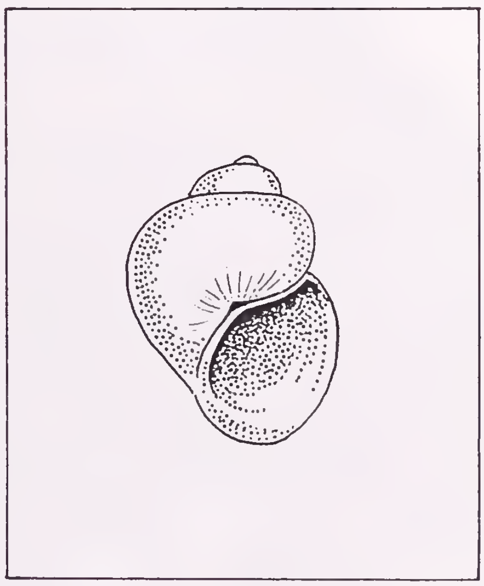


Fig. 16 Rissoellidae *Rissoella (Zelaxiatas) micra* (Finlay, 1924)
Location Derry Castle Reef, Enderby Island, in shell sand
Size Height 1.53mm. Width 0.96mm.

11. *Zalipais lissa* (Suter, 1908)

This species was collected at the Meteorological Station, Campbell Island in 1993 and had not been recorded from the Subantarctic previously. This new extension of range was inadvertently omitted from my previous species list (Morley 1994).

12. ? *Zerotula nautiliformis* Powell, 1927 (Fig. 17) (AK 130709)

The holotype was dredged off Puysegur Point in 310 m, southwest Otago. This microscopic gastropod was found in shell sand at Derry Castle Reef, Enderby Island, providing an extension of range.

This species belongs more correctly in the genus *Adeuomphalus* (B. Marshall, writt. comm. May 1990).

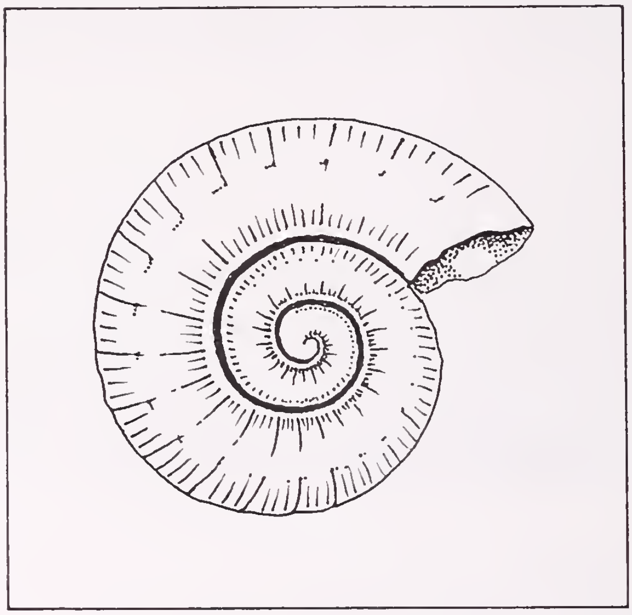


Fig. 17 ? Architectonicidae *Zerotula nautiliformis* Powell,1927.
Location Derry Castle Reef, Enderby Island
Size Diameter 0.8mm. Height 0.31mm.

13. *Benthocardiella obliquata bountyensis* Powell, 1933 (Fig. 18) (AK 131360)

The holotype of this species was dredged in 300 m off the Bounty Islands.

Ten specimens of this tiny bivalve were found in gravel at at a depth of 10 m at the entrance to Godley Valley, Carnley Harbour, Auckland Island. This is the first record at this location.

Powell (1933) stated that the subspecies *B. obliquata bountyensis* has two chararacteristics that distinguish it from the typical species *B. obliquata obliquata* (Powell, 1930):

a) Outline: Compared with *obliquata* the outline of the Bounty Islands subspecies is more regularly ovate and not so elongate. However the Auckland Island specimens show a range of outline from regularly ovate to the outline of the typical species *B. obliquata obliquata* that is with the anterior end produced and the posterior end truncated.

b) Protoconch: The protoconch is bounded by a raised rim but differs from that of *obliquata* in having the anterior and posterior edges of the rim more equally thickened and the apex of the protoconch as a prominently raised conical beak. In the typical species the anterior end of the rim is produced into a prominent knob, the posterior one is very feeble and the umbo bears no conical projection. When looking at the specimens it appears that Powell (1933) inadvertently reversed the words anterior and posterior.

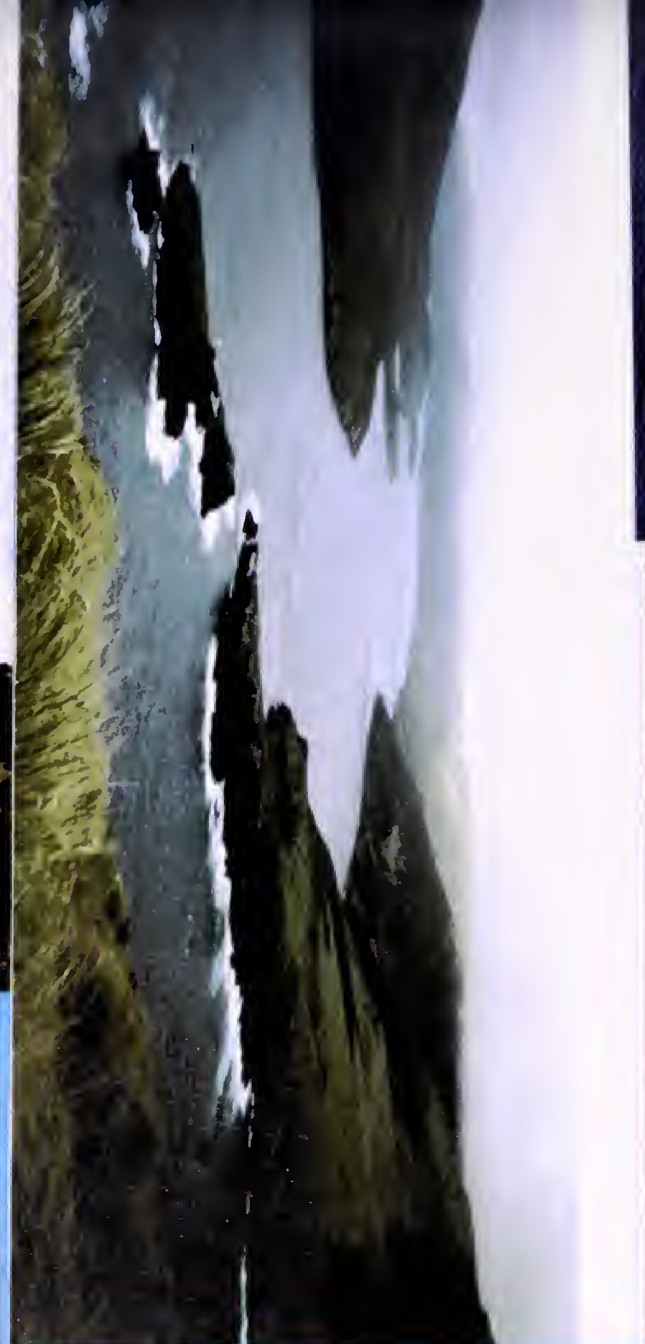
In my specimens there is a prominent conical projection at the apex and the rim is raised and thickened, but there is a distinct knob at the posterior end, i.e. a mixture of the distinguishing features.


Uttlea spp.


Balcis spp.


1.
2b
2


Unidentified species
found live




Acteon milleri &
A. cratericulata

Specimens examined:

a) *Benthocardiella obliquata obliquata*

The holotype (AK 70098) is a single valve. The rim and knobs of the protoconch match those in my specimens, but differ in not having a central boss. The inflation is similiar in both lots. The shape of my specimens is similiar to the holotype except for the shallow notch on the margin of the posterior end which is subobselete or absent.

b) *B. obliquata obliquata*

There are 26 paratypes (AK 71457), some are double valves, all show signs of abrasion.

Summary:

These specimens may prove to be a distinct species. (B. Marshall pers. comm.)

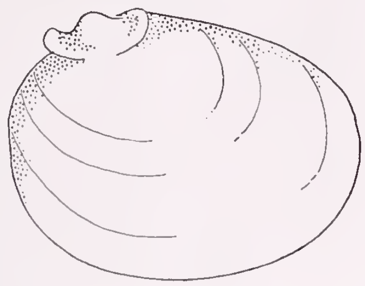


Fig. 18 A *Benthocardiella obliquata* Powell, 1933.
Location: Entrance to Godley Valley, Carnley Harbour, SCUBA 10m.
Size: Height 0.84mm. Width 0.97mm.

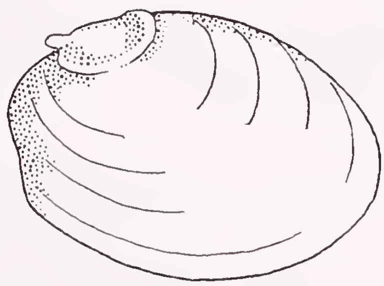


Fig. 18 B *Benthocardiella obliquata obliquata* Powell,1930 holotype after Powell (1930).
Location Off Mangonui Heads, 10-18m.
Size Height 0.8mm. Width 1.06mm.

14. *Myllitella vivens* Finlay, 1927 (Fig. 19) (AK 130565)

A single valve of this species was found in shell gravel at a depth of 10 m near the entrance to Godley valley in Carnley Harbour. This is the first record of this genus in the Subantarctic.

Specimens examined:

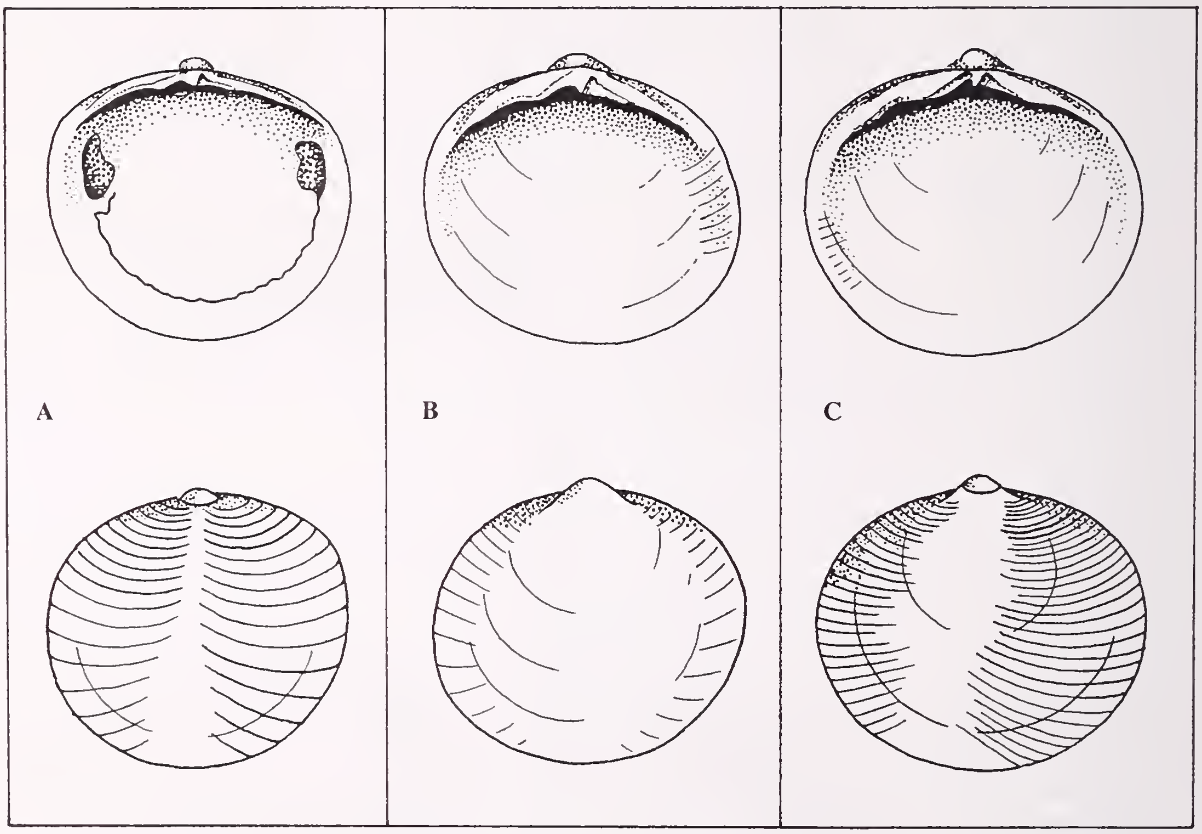
a) *Myllitella vivens vivens* Finlay, 1927 Oneroa, Waiheke Island, Waitemata Harbour, 20 specimens sieved alive in low tidal sand, author's collection.

b) *Myllitella vivens pinguis* Marwick, 1928 Waitangi, Chatham Island, 15 specimens washed in at high tidal level, author's collection.

Powell (1979) stated that the heavier hinge of *M. vivens pinguis* is the only distinguishing feature for the subspecies. The hinge of the Subantarctic specimen has a cardinal the same size as those of Oneroa specimens but the laterals are heavier and match those of Waitangi specimens.

The Subantarctic specimen has a much finer pattern of raised arcuate raised ridges, about 36 compared to 17 on specimens from Oneroa and Waitangi. More Subantarctic specimens are needed to confirm the noted differences and decide on the validity of erecting a new species.

Fig. 19 Erycinidae *Myllitella vivens* Marwick, 1927.



KEY:

A. *Myllitella vivens vivens* Finlay, 1927
Location Oneroa, Waiheke Island, Waitemata Harbour, sieved alive in low tidal sand. Author's Collection
Date 28 August 1988
Size Height 2.68mm. Width 2.87mm. Thickness 2 valves 1.38mm.

B. *Myllitella vivens pinguis* Marwick, 1928
Location Waitangi, Chatham Island, in shell sand. Author's Collection
Date 1 February 1989
Size Height 2.62mm. Width 2.89mm. Thickness 2 valves 1.46mm.

C. *Myllitella vivens* Marwick, 1927
Location Entrance to Godley Valley, Carnley Harbour, Auckland Island, SCUBA, depth 10m.
Date 10 January 1995
Size Height 2.71mm. Width 3.03mm. Thickness 2 valves 1.5mm.

15. *Tawera* Marwick, 1927

There were lengthy investigations to find a name for the three live *Tawera* specimens from 12.5 m. off Erebus Cove, Ross Harbour, Auckland Island. (AK 130438)

Specimens examined:

a) *Tawera rosa* Powell, 1955

Paratypes (AK 72378) consist of three odd valves with worn sculpture. They were washed up on the outer coast of Rose Island, Ross Harbour, Auckland Islands. The shape of my specimens match that of the paratypes. Smaller specimens from both locations tend to be subtrigonal with projecting beaks, while larger shells are more oval (Fig. 20). There are 10 concentric ridges per cm on the holotype, on my specimens there are 11, 12 and 14 ridges. The paratype and Erebus Cove specimens are purple below the pallial line on the interior of the valves.

b) *Tawera bollonsi* Powell, 1932

The holotype (AK 70758) is a single valve collected in 16-64 m in Carnley Harbour, Auckland Island. The concentric ridges are worn flat and number 7 per cm. It is slightly more inflated than the *Tawera rosa* paratypes but only marginally more than my specimens. The interior of the paratype valves is white.

Tawera bollonsi was descibed by Suter (1905) under the name *Cytherea subsulcata* Suter, 1905 This early combination was not mentioned by Powell (1979). Suter described the sculpture as "broad depressed and flattened concentric ribs and radial striae". The radial striae are a distinctive feature in my specimens but not mentioned by (Powell 1955, 1979). The hinge characteristics and the numerous fine ventral crenulations are the same in both *T. bollonsi* and *T. rosa* (Powell 1979). The type localities for the two species are both on Auckland Island 38 km apart.

Summary

Powell (1955) gives the following as distinguishing features:

a) Shape: *T. bollonsi* broadly subtrigonal, *T. rosa* roundly ovate.

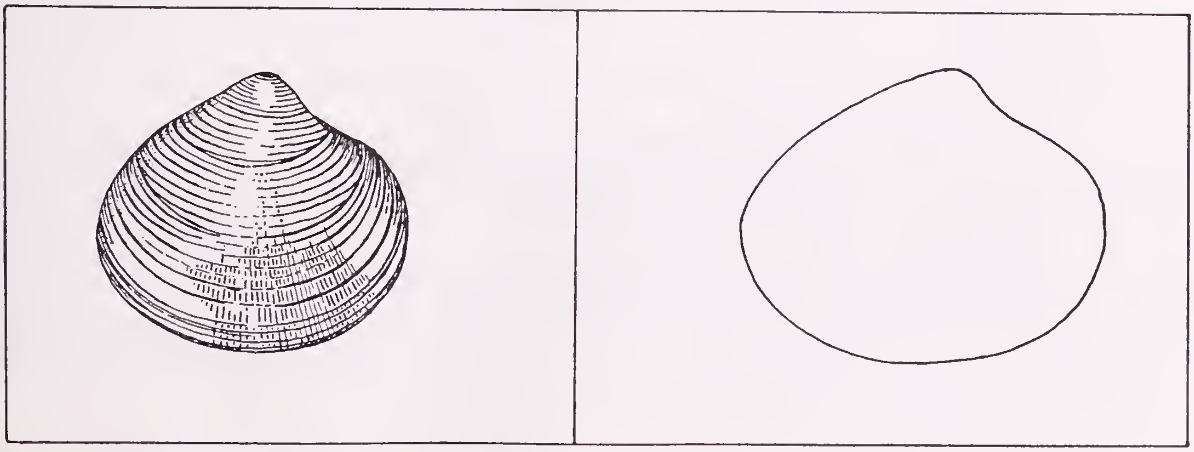
b) Sculpture: *T. rosa* with closer more regular concentric ridges than *T. bollonsi.*

c) Inflation: *T. rosa* less inflated than *T. bollonsi.*

I have used the older name *T. bollonsi* for the Erebus Cove specimens as I am unconvinced by the specimens I have seen of the significance of the differences between *T. bollonsi* and *T. rosa* as given by Powell. I consider *T. rosa* to be a junior synonym of *T. bollonsi.*

Fig. 20 *Tawera bollonsi* Powell, 1932.
Location: Erebus Cove, Auckland Island. 12.5m.
Size: Height 33.7mm. Length 36.6mm.

Outline of largest specimen showing variation in shape.
Size: Height 35.8mm. Length 42.6mm.



MARINE RESERVE STATUS

The Subantarctic Islands are being considered for Marine Reserve status. At present the land down to low water mark is reserve controlled by the Department of Conservation. Below low water is controlled by the Ministry of Fisheries. This causes confusion when applying for a permit to collect intertidally and to snorkelling depths. The fauna to the indiscernible low water level is fully protected while fauna below that level has only minor restrictions. (e.g. there is a limit of 50 specimens per day for a week and is termed recreational fishing). This limit is not applicable in practice to micromolluscs. From an ecological point of view the low water mark is not a valid boundary to end the reserve, protection should be extended not only to the shallow coastal waters, but also to 100 km offshore in order to stop the bycatch of Hookers Sealions in the nets of squid trawlers.

CONCLUSION

The 46 mollusc species from my two short trips showing an extension of range, indicate that further study is necessary to obtain more comprehensive data on molluscs from the Subantarctic Islands. The next most productive methods of collection would appear to be harbour and coastal dredging and additional diving.

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MOLLUSCA OF THE AUCKLAND AND SNARES ISLANDS: SPECIES LIST, 1995

KEY:

I - Island, INT - Intertidal, RF - Reef, A - alive, D - dead, j - juvenile
* - extension of range, SN - snorkel, S - SCUBA, Stations 1-9 Auckland Islands,
10, 11 -Snares Island

POLYPLACOPHORA	1. EREBUS COVE (S)	2. EREBUS COVE (SN)	3. SANDY BAY END.I. (S)	4. SANDY BAY END. I. (INT)	5. DERRY CASTLE RF. (INT)	6. N.E. COAST END. I. (INT)	7. S.W. CAPE (INT)	8. GODLEY VALLEY (S)	9. TAGUA BAY (INT)	10. HOHO BAY SNARES I. (SN	11. HOHO BAY SNARES I. (S)
Callochiton empleurus					Dj			A			
Ischnochiton circumvallatus								A	A		
Ischnochiton luteroroseus					Dj			A			
Ischnochiton sp.					Aj			Aj			
Leptochiton subantarcticus								Aj			
Leptochiton sp.					Aj						
Onithochiton neglectus subantarcticus		A	A	A	A		A				
Plaxiphora aurata	A	A	A		A		D	A		A*	
Polyplacophora sp. indet.					Aj			Aj			
Rhyssoplax aerea			A					A			

GASTROPODA	1. EREBUS COVE (S)	2. EREBUS COVE (SN)	3. SANDY BAY END.I. (S)	4. SANDY BAY END. I. (INT)	5. DERRY CASTLE RF. (INT)	6. N.E. COAST END. I. (INT)	7. S.W. CAPE (INT)	8. GODLEY VALLEY (S)	9. TAGUA BAY (INT)	10. HOHO BAY SNARES I. (SN)	11. HOHO BAY SNARES I. (S)
Actinoleuca campbelli campbelli	A				D			D			
Antiguraleus subtruncatus				D							
Atagema carinata			A*								
Benhamina obliquata		A			A						
Brookula (Liotella) polypleura					D*			D*			
Brookula (Liotella) rotula					D*						
Buccinulum pertinax pertinax		A	A					A	D		
Caecum digitulum								A*			
Calliostoma granti											A
Calliostoma spectabile						D	A				
Cantharidus capillaceus capillaceus	A	A	A		A	D	A	A	A		
Cellana strigilis flemingi										A	
Cellana strigilis strigilis		A		A	A	D	A		A		
Chemnitzia spp.			D							D	
Chemnitzia zealandica					D			D			
Cirsonella densilirata					D						
Cirsonella parvula ?					D*						
Cominella nassoides nassoides											A*
Comptella devia					D						
Curveulima otakauica								D*			
Diloma arida									A		
Diloma nigerrima							A				
Eatoniella (Albosabula) poutama								D			
Eatoniella (Caveatoniella) perforata								A			
Eatoniella (Caveatoniella) puniceomacer					D*						
Eatoniella aff. *atropurpurea*					D*						
Eatoniella bathami								D*			
Eatoniella fuscosubucula					D						
Eatoniella kerguelenensis chiltoni					A			A	A	A	
Eatoniella notabalia			A							A*	
Eatoniella roseola	D		D		D			D		D	
Eatoniella smithi					A			D			
Eatonina (Otatara) subflavescens					D*						
Evalea sabulosa					D			D			
Haliotis (Sulculus) virginea huttoni			A		D	D	D	A	D		
Haliotis (Sulculus) australis											D
Kerguelenella innominata							A				
Laevlittorina (Macquariella) aucklandica					D						
Lepsithais lacunosus		A	A	A	A	D					

GASTROPODA	1. EREBUS COVE (S)	2. EREBUS COVE (SN)	3. SANDY BAY END.I. (S)	4. SANDY BAY END. I. (INT.)	5. DERRY CASTLE RF. (INT.)	6. N.E. COAST END. I. (INT.)	7. S.W. CAPE (INT.)	8. GODLEY VALLEY (S)	9. TAGUA BAY (INT.)	10. HOHO BAY SNARES I. (SN.)	11. HOHO BAY SNARES I. (S)
Linopyrga rugata rugata					D			D			
Liracraea epentroma subantarctica			A		D			D			
Liracraea odhneri odhneri					D*						
Liratilia conquista angulata					D*						
Lodderia eumorpha eumorpha					D			Dj			
Margarella antipoda antipoda					A	D			A		
Margarella antipoda rosea ?				A	A						
Marinula striata					D						
Melanella aucklandica					D						
Melanochlamys sp.			A								
Mendax trizonalis odhneri					D						
Merelina plaga								D			
Monophorus fascelinus					D						
Nodilittorina cincta					A		A				
Notoacmea pileopsis sturnus					A		A		A		
Odostomia aucklandica					D						
Odostomia acutangula					D*						
Odostomia incidata					D*						
Odostomia parvacutangula					D						
Odostomia sp.					D						
Onchidella campbelli					A						
Onoba delicatula			A		D			D	A		
Onoba delta								D		A	
Onoba foveauxiana										D*	
Onoba fumata										A*	
Onoba gamma			A*								
Onoba insulpta								D			
Onoba lubrica					D			D			
Onoba spp.			D		D			D			
Orbitestella hinemoa					D*			D*			
Patelloida corticata										A*	
Paxula subantarctica subantarctica								A		A*	
Paxula transitans					D						
Pisinna minor					D			D	D	D*	
Pisinna rekohuana rekohuana					A			D		A	
Pisinna subfusca subfusca										D	
Powellisetia microstriata					D*						
Powellisetia subtenuis					D			D			
Pupatonia minutula					D*						
Rissoella (Jeffreysiella) rissoaformis		A			A					A*	

GASTROPODA	1. EREBUS COVE (S)	2. EREBUS COVE (SN)	3. SANDY BAY END.I. (S)	4. SANDY BAY END. I. (INT.)	5. DERRY CASTLE RF. (INT.)	6. N.E. COAST END. I. (INT.)	7. S.W. CAPE (INT.)	8. GODLEY VALLEY (S)	9. TAGUA BAY (INT.)	10. HOHO BAY SNARES I. (SN.)	11. HOHO BAY SNARES I. (S)
Rissoella (Zelaxitas) micra					D*						
Rissoella flemingi					A*						
Rissoella sp.					A					A*	
Scissurella fairchildi					D*						
Sigapatella novaezealandiae			D		D		D	D			
Sinezona laqueus					D*						
Sinezona levigata			D		D					A	
Skenella pfefferi										A*	
Sukashitrochus lyallensis					D						
Terelimella benthicola					D*			D*			
Teretriphora huttoni					D						
Thoristella chathamensis aucklandica	A		A		D						
Trichosirius octocarinatus			D		D						
Tubbreva exaltata exaltata			D					D			
Xymene huttoni			A*								
Xymene aucklandicus		A			A			A		A	
Zaclys sarissa					D						
Zalipais lissa					D*						
Zalipais benthicola					D*						
Zerotula aff. *nautiliformis*					D*			D*		D*	

BIVALVIA											
Aulacomya atra maoriana	A	D	A		D				A		
Benthocardiella obliquata								D*			
Borniola decapitata					D						
Condylocardia crassicostata					D			D			
Cyamiomactra problematica					D						
Gaimardia fosteriana aucklandica					D						
Gaimardia trapesina coccinea					Aj*						
Gaimardia trapesina flemingi			A								
Hiatella arctica					A			D			
Kellia cycladiformis					D*						
Kidderia (Costokidderia) costata					D						
Kidderia campbellica					D*						
Lasaea hinemoa					A		A		D		
Lissarca aucklandica	A				A			A		D*	
Lissarca exilis										D	
Lissarca harrisonae					D*						
Modiolus areolatus					A		D	D	A		
Myllitella vivens cf. pinguis								D*			

BIVALVIA	1. EREBUS COVE (S)	2. EREBUS COVE (SN)	3. SANDY BAY END.I. (S)	4. SANDY BAY END. I. (INT.)	5. DERRY CASTLE RF. (INT.)	6. N.E. COAST END. I. (INT.)	7. S.W. CAPE (INT.)	8. GODLEY VALLEY (S)	9. TAGUA BAY (INT.)	10. HOHO BAY SNARES I. (SN.)	11. HOHO BAY SNARES I. (S)
Mytilus edulis galloprovincialis					A		A	A	A		
Neolepton antipodum					A			D		D	
Nucula nitidula			D		D			A			
Nucula hartvigiana								A			
Perrierina (Legrandina) aucklandica								D			
Philobrya hamiltoni					D						
Ruditapes largillierti	A		D		D			A	D	D*	
Tawera bollonsi	A				D		D		A		
Verticipronus mytilus					D				A		
Xenostrobus pulex				A			A		A		
Zygochlamys delicatula					D						

POIRIERIA TWENTY YEARS AGO from Nancy Smith

Myochama tasmanica (Tenison Woods 1877) of Tasmania and S.E.Australia was recorded in the Parengarenga Harbour, a first for N.Z. The tiny bivalves (12-14mm) found in dredgings, were attached to larger objects, often valves of *Tawera spissa,* and were not uncommon if you took the trouble to sort through heaps of dead shells. This find was proved to be not a new immigrant when Dr. Powell went back to some 1932 dredgings from the Parengarenga and found a single valve of *M. tasmanica* that he had previously overlooked.

Richard Willan listed the species he had found common to the New South Wales Coast of Australia and North Auckland, N.Z. and discussed the variations in the molluscs and in the names.

Ken Grange was studying the feeding habits of Baryspira australis Sowerby (sic) and Richard Willan was reporting Lyroselia chathamensis feeding with their heads buried into the sponge Polymastia granulosa in 5 to 10 metres of water.

The Gardners were fossicking in Taurikura, Whangarei Heads, and comparing their finds with those of ten years earlier when the Section had a field trip there.They were also describing and illustrating the various species of Margarella in our cooler southern waters.

The first live "cave snails" *Opacuincola* were collected by dibbling a branch down a hole (reminds me of chimpanzees!). *Penion* was going round in circles with *P. adusta* becoming *P. dilatatus* and which then became *P. cuvierensis.* Yes, that was 20 years ago!

Subantarctic Asteroidea
by Fiona Thompson

1. *Allostichaster insignis* usually has 6 arms with a grouping of 3 by 3 . The northern species *A. polyplax* is more likely to have 8 arms of 4 by 4. The characteristic grouping is due to its habit of dividing non-sexually across the disc into two specimens each of which will grow another set of arms. Hence their disparate size. When they develop from eggs, the young have five arms, the extra arms are added when the non-sexual mode is adopted.

2. & 2a. *Calvasterias suteri* ranges no further north than Banks Peninsula. Mainland species are smaller than those from the Subantarctic. Both *Calvasterias spp.* brood their young, the eggs protected by the female and afterwards carrying the young stars on the lower side for several months, there being no laval stage. The allied species *C. laevigata* does not have such a well marked carinal (mid-arm) series of spines (enlarged granules).

Mission Bay Sand Replenishment from Pakiri Dredging.

by Margaret S. Morley, Fiona Thompson, Nancy Smith,
Glenys A. Stace and Bruce W. Hayward.

Life has its ironies. When the Auckland City Council proposed refurbishing Mission Bay Beach, and bringing in sand dredged from 4km off Pakiri Beach (Fig. 1), hardly a whimper of protest was heard. Mission Bay is the most affluent suburb of Auckland, and the residents and tourists were having to endure mud and rock. New sand had to come from somewhere. All the correct procedures were followed, relevant permissions sought and granted. The dredge site was surveyed and core samples taken. In September 1995, the trucks began arriving.

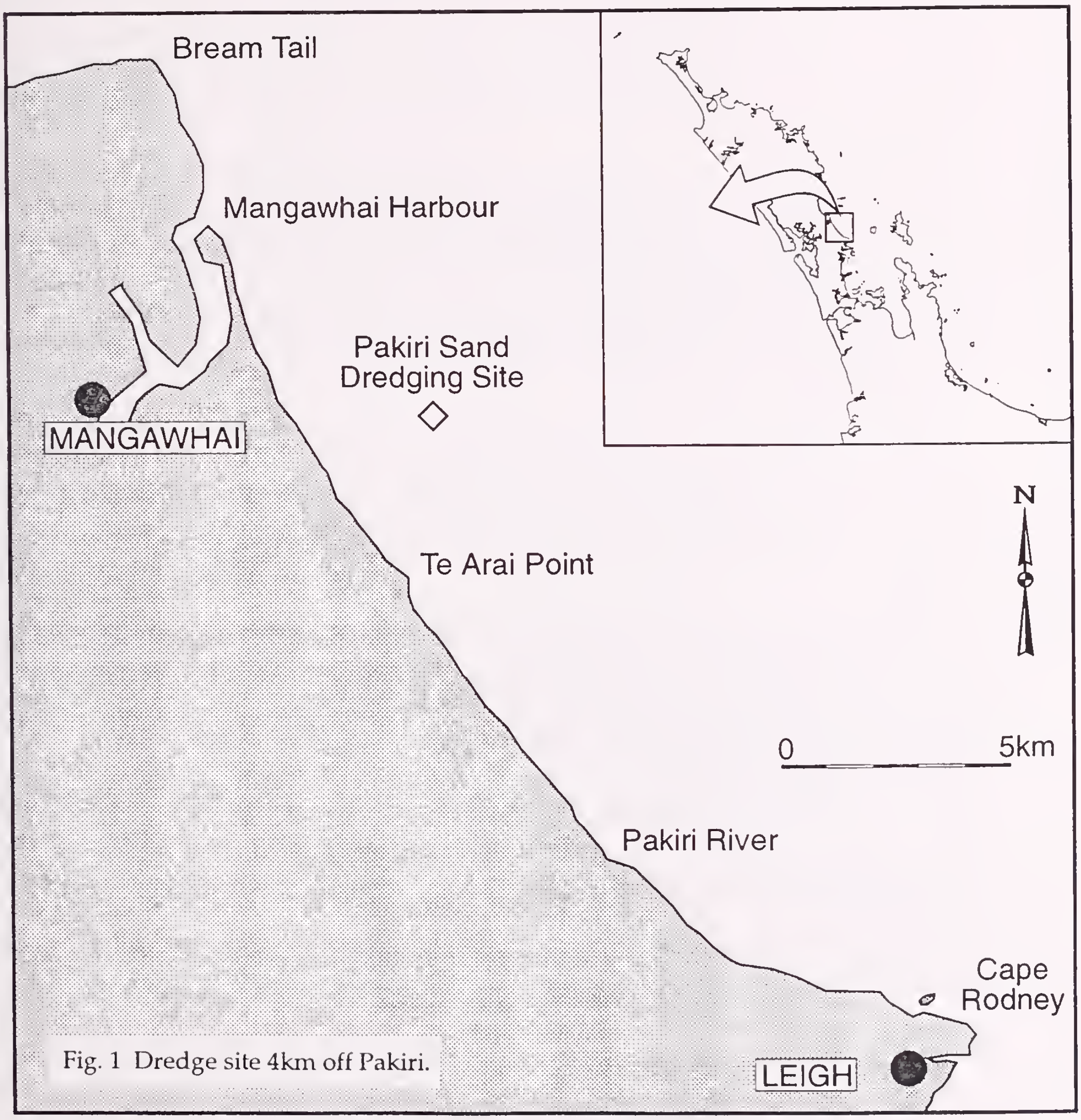


Fig. 1 Dredge site 4km off Pakiri.

A considerable burst of energy developed concurrently at Auckland Museum as members of the Conchology Section found it necessary to travel to the Museum via Mission Bay more and more regularly to monitor what was being washed out. From

the first delivery of the dredged sand, shell collectors have had some of their wildest dreams come true. The deep water molluscs have been sorted and washed by each succeeding tide and left for inspection on the tide line, mingled with the limited range of local species usually found there. Unfortunately the body whorl of most of the larger gastropods was usually damaged even though the animal was still alive inside. The volute *Alcithoe arabica*, some specimens reaching 18 cm in length, is a typical example. Species such as *Pecten novaezelandiae* were found in abundance. Most adult shells were single valves and often broken whereas the many juveniles were conjoined and freshly dead. *Struthiolaria vermis vermis, Austrofusus glans, Mesopeplum convexum* and *Amalda mucronata* were common. Paired and sometimes live *Venericardia purpurata, Notocallista multistriata, Dosinia maoriana* and *Pratulum (=Nemocardium) pulchellum* could be plucked from the beach at any level.

The smaller molluscs tend to be deposited in drifts against the groyne at the Kohimarama end of the beach, or deposited at the interface of the sand and the low tidal flats. *Phenatoma rosea, P. zelandica, Acteon milleri, Globosinium drewi, Coluzea spiralis, Casmaria ponderosa perryi* and an *Uttleya* species are but a few of the rarer gastropods. Among the bivalves have been paired *Scalpomactra scalpellum* and *Cuspidaria trailli.*

On the 20th April, the Conchology Section held a field trip for members to Mission Bay and invited the members of the Museum's children's club the "Dinomites" to join them. Members helped children find and identify many species. A search at low tide (0.3m) found snapper biscuits *Fellaster zelandica*, a few *Myadora striata, Cominella adspersa* and one *Amalda australis* living on the beach. The children had to be convinced that the snapper biscuits were alive and it wasn't a good idea to take piles of them home!

While the replenishment scheme has been a bonanza for shell collectors and scientists it raises some serious environmental questions. The sea floor of the Pakiri area is rich in marine life. Large numbers of animals are being sacrificed to improve one beach for people. Little is known about how long the sand will remain at Mission Bay. Older residents recall that a lot of sand was brought to Mission Bay from Pakiri in the 1950's.

The dredge site was surveyed and measured for suitability of sand type, but we have no clear idea of what damage has been done there. Sand is being continuously dredged off Pakiri by several other operators. We understand that the sand used in construction of Auckland's Casino Sky Tower is coming from there.

Another concern is the large numbers of juvenile molluscs in the dredgings. Tiny *Alcithoe arabica* barely beyond the protoconch stage as well as *Astrea heliotropium* and *Xenophora neozelanica* less than 1cm in diameter have died in their hundreds.

Are there sufficient controls in place? Is the current level of dredging causing irreversible damage?

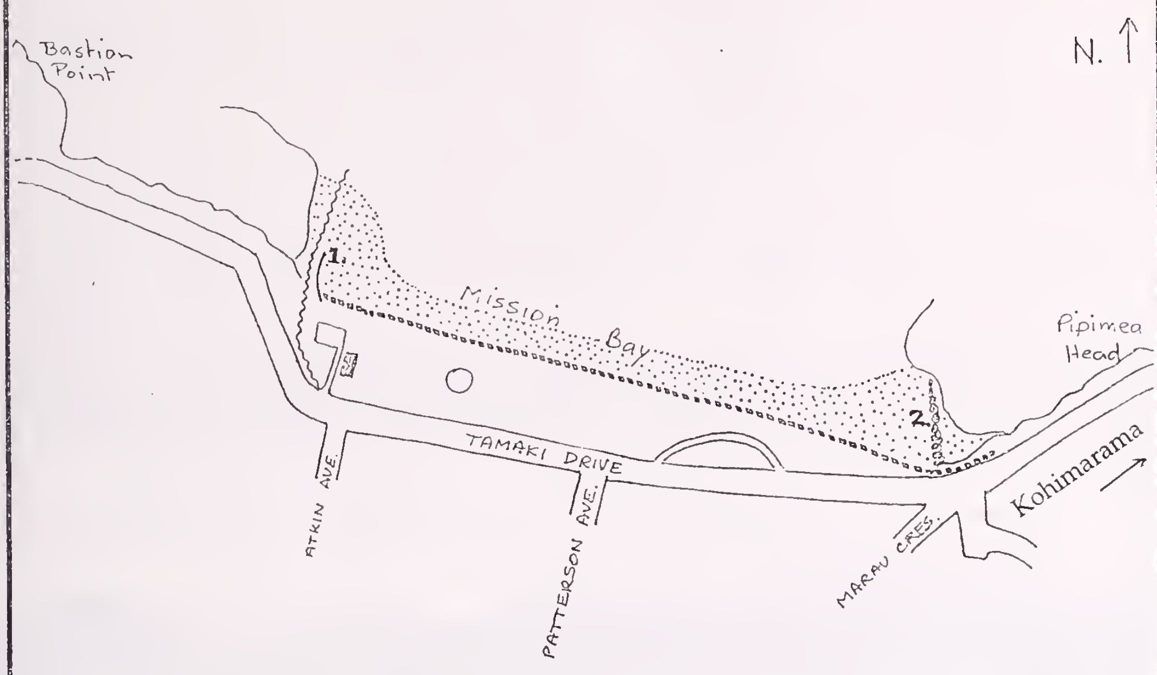
Now there's the irony. The excitement of finding such species without having to dive or dredge, presents an unexpected opportunity. There on the beach were hundreds of molluscs spread out for collectors to make their choice. They came from an environment rich in species usually considered rare. Why have we not yet raised our voices to question or protest?

The authors feel these questions need to be answered and plan to present the relevant authorities with data supporting a protest.

Mission Bay Sand Replenishment Project

The sand replenishment at Mission Bay was commenced after much discussion and consultation. The six month scheme at a cost of $2 million was commenced in September 1995. The stream draining into the city end of the beach was diverted and restrained by a basalt rock wall. A rock groyne was built at the Kohimarama end of the beach. These structures were designed to prevent the new sand being washed away by wave action during storms and by long shore drift (Fig.2).

Fig. 2 Mission Bay to show the new groynes.



1. Retaining wall to divert stream
2. Rock groyne

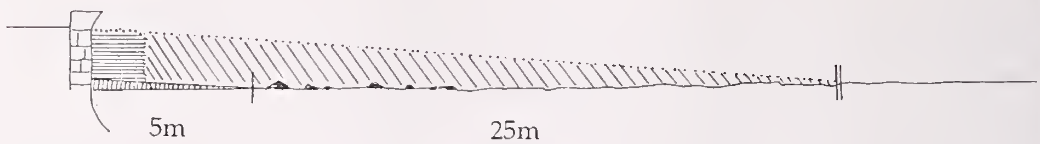
To comply with the Resource Management Act, certain conditions had to be met. Sand is dredged 4km off Pakiri, about 80km north of Auckland, from an area 400m by 300m marked by buoys (36°07′E 174°37′S) (Fig. 1). A total of 30,000 cu. m of sand will be transferred. A suction dredge on a barge is used in depths of 38 - 40m. The sand is offloaded onto trucks at Auckland.

At Mission Bay the sand was placed 2m deep against the sea wall. Some of the delivered sand was contoured by graders, but northerly storms also repositioned the sand into a normal profile. The dumping process continued every 2 - 3 days throughout September, October and November. Gradually the sand was dumped further away from the wall and further along the beach from the two vehicle entrances.

A severe storm on November 1st dramatically moved the interface between the sand and the low tidal flats further out towards the sea (Fig. 3).

There has been only minimal movement of Pakiri material out of the area between the groynes. There was some vertical stacking, i.e. packed together with the valves on edge, of *Pecten novaezelandiae* at the sand and low tidal flat interface.

Fig. 3 Diagrammatic section of Mission Bay
to show the initial and current level of Pakiri sand.



KEY:

Mission Bay sand

sand / low tidal flat interface May 1996

First dump of Pakiri sand

Pakiri sand repositioned May 1996

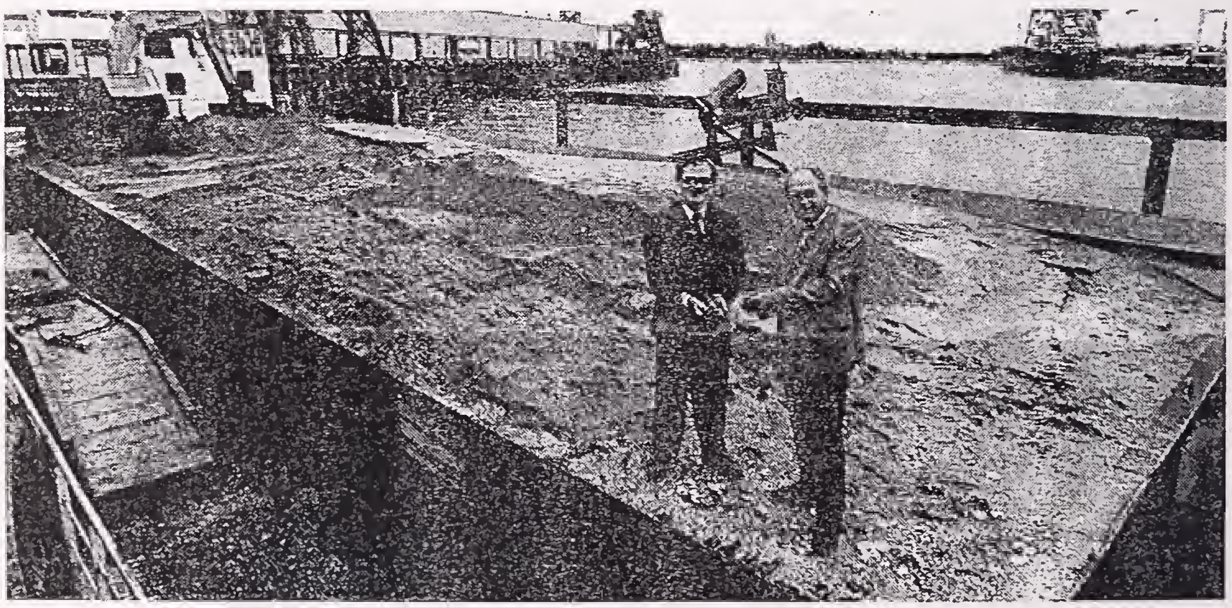
sea wall

sand / low tidal flat interface Aug. 1995

rocks

Pakiri sand was not dumped during the summer months of December to February and was recommenced in March. The whole exercise is designed to take a total of six months and the Council is committed to maintaining 15m width of sand against the sea wall in the future.

The sand barge docked at Auckland



CITY SCENE

Mission Bay Sand Project reaches halfway mark

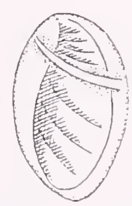
Some interesting finds.

One of the most exciting molluscs collected at Mission Bay is an *Uttleya* species (Fig. 4). These specimens are up to 15mm in length and have features that differ from either of the *Uttleya* described in Powell (1979). The genus *Uttleya* has, up until now, been considered rare (Bruce Marshall pers. comm.). About 500 specimens with a wide range of ornament have been found. Some are smooth, some have spiral cords with a few varices and some have both spiral and lamellose axial sculpture. When examined microscopically nearly all, except the severely worn ones, have some residual traces of sculpture. The proportions are variable, some specimens being taller in the spire. The colour ranges from pale buff through yellow to dark brown. A white band just below the periphery of the body whorl is present on most specimens. About 15% have a spiral cord on the upper third of the post-nuclear whorls. In some specimens there is a slight angulation at the level of the cord. Two specimens have been found alive. The operculum is yellowish brown with a thin purple border, probably staining. There is a strong rounded ridge on the internal surface and a groove on the external surface. (Fig. 5). There is no correlation between the variable features of proportions, colour or sculpture. No doubt there will be a publication on this mollusc when the research has been done.

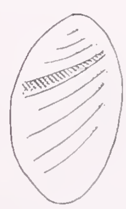
Fig. 4 Muricidae *Uttleya* sp. - specimen with spiral ornament
Height 15.05 mm **Width** 5.8 mm.

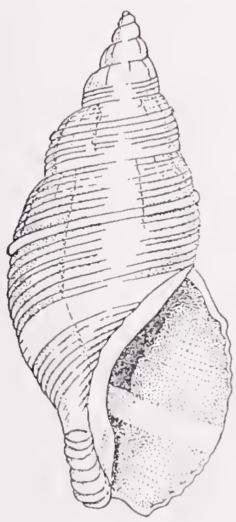
Fig. 5 Operculum of *Uttleya* sp.

Exterior surface



Interior surface





Another mollusc of interest which will be the focus of more research is a species of *Paphies* most closely aligned to *donacina* which has appeared since dredging resumed in March. Large, very eroded specimens probably of sub-fossil origin have been collected in large numbers. Also appearing at the same time, were a few *Anadara trapezium*, the Sydney Mud Cockle that is now extinct in New Zealand. Dr Scott

Nichols of the Geography Department at Auckland University is working on the dredge core samples taken before dredging was approved and it is hoped that the core samples will be able to provide some information about the origin of these specimens.

In addition to molluscs, many large red brachiopods *Terebratella haurakiensis* have been found. These live in northern New Zealand in deep water (>30m) often attached to dead shells and other hard debris. They are not commonly found washed up, especially as double valves or with the animal inside. The smaller, very common, red brachiopod, *Calloria inconspicua* (senior of *Waltonia*) is also found. This species, occasionally found on local beaches has been found here in great enough quantity to suggest its origin is Pakiri.

Seventy-one species of foraminifera (marine, shelled Protozoa) have been identified from the sand brought in from Pakiri. The fauna is dominated by a combination of species of *Quinqueloculina, Notorotalia, Bulimina submarginata* and *Elphidium charlottense.* This combination is typical for sandy environments at 30-60 m depth around much of New Zealand. Among the rarer species is *Frondicularia bassensis. Frondicularia* is never very common and this particular species has not previously been recorded from New Zealand, although it is known from off the Cavalli Islands (BWH pers. obs.).

At this stage of the replenishment scheme the beach is well stocked with sand. The goal of improving the recreational use of the beach has already occurred. The interest of shell collectors will continue for some time yet!

A Selection of Species

Acknowledgements

We thank Bruce Marshall for updating some of the names in the species list Brett Stephenson and Jenny Riley for identifying some of the Crustacea and all the members of the Conchology Section who have helped to compile the species list.

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PAKIRI / MISSION BAY SPECIES LIST			
220 molluscan species have been found to date. Voucher specimens are			
deposited in Auckland Museum collecton			
	Most likely source		
	m: Mission Bay	a=alive	r=rare 0-4
	p: Pakiri	or	p=present 4-15
	e: either	d=dead	c=common 15-30
			a=abundant >30
GASTROPODS	**Pakiri**	**Alive?**	**Quantity**
Acteon cratericulatus	p	d	r
Acteon (Maxacteon) milleri	p	d	p
Aeneator otagoensis	p	a	p
Aeneator larochei	p	d	r
Agatha georgiana	p	d	r
Alcithoe arabica	p	a	c
Alcithoe fusus haurakiensis	p	d	p
Amalda (Baryspira) australis	m	d	c
Amalda (Baryspira) depressa	m	d	p
Amalda (Baryspira) mucronata	p	a	c
Amalda (Gracilispira) novaezelandiae	p	d	c
Amphibola crenata	m	d	r
Antimelatoma buchanani maorum	p	d	r
Antisolarium egenum	e	a	p
Aoteatilia larochei	p	d	r
Aplysia parvula	m	d	r
Architectonica reevei	p	d	r
Argobuccinum tumidum	p	d	r
Astraea heliotropium	p	d	r
Austrofusus glans	p	a	c
Austromitra rubiginosa	p	d	p
Brookula aff. prognata	p	d	a
Buccinulum linea	m	a	p
Buccinulum vittatum	m	d	p
Bulla quoyi	m	d	p
Bullina lineata	p	d	r
Cabestana spengleri	p	d	p
Cabestana waterhousei	p	d	r
Caecum digitulum	e	d	r
Calliostoma osbornei	p	d	r
Calliostoma pellucidum	p	a	r
Calliostoma pelucida spirata	p	d	p
Calliostoma punctulatum	p	a	p
Calliostoma selectum	p	a	r
Calliostoma tigris	p	d	r
Cantharidus purpureus	p	d	r
Casmaria ponderosa perryi	p	d	r
Cellana ornata	m	a	c
Charonia lampas rubicunda	p	a	r
Chemnitzia sp.	e	d	r
Cirsostrema zelebori	e	d	r
Coluzea spiralis	p	d	p
Cominella adspersa	e	a	c
Cominella glandiformis	m	a	p

Cominella maculosa	m	d	r
Cominella quoyana	p	d	c
Cominella virgata virgata	e	d	r
Crepidula costata	e	d	c
Crepidula monoxyla	e	d	p
Crepidula youngi	p	d	r
Crosseola bollonsi	p	d	r
Crosseola vesca	p	d	r
Cylichna thetidus	p	d	c
Cymatium exaratum	p	a	r
Cymatium parthenopeum	p	a	c
Dicathais orbita	e	a	p
Diloma subrostrata	m	d	p
Duplicaria (Pervicacia) tristis	e	d	p
Eatoniella limbata	p	d	r
Eatoniella maculosa	p	d	r
Elachorbis subtatei	p	d	r
Emarginula striatula	p	d	c
Epitonium bucknilli	p	d	r
Epitonium jukesianum	e	d	r
Epitonium minora	p	d	p
Epitonium tenellum	e	d	r
Epitonium sp.	p	d	r
Eulima levilirata	p	d	r
Eulima sp.	p	d	r
Finlayola lurida	p	d	r
Gadinalea conica	p	d	r
Glaphyrina caudata	p	a	p
Globisinum drewi	p	d	r
Haminoea zelandica	m	d	r
Haustrum haustorium	m	d	p
Helix aspersa	m	d	p
Herpetopoma bella	e	d	r
Herpetopoma larochei	p	d	r
Heterocithara mediocris	p	d	r
Hypermastus bulbula	p	d	r
Lamellaria ophione	e	d	r
Lepsiella scobina	m	d	p
Liratilia sinuata	p	d	r
Lironoba aff. *finlayi*	p	d	r
Maoricolpus roseus roseus	e	d	c
Maoricrater explorata	p	d	r
Marinula filholi	m	d	r
Melagraphia aethiops	m	a	c
Melanochlamys cylindrica	p	a	p
Melanopsis trifasciata	m	d	r
Micrelenchus rufozonus	p	d	c
Micrelenchus sanguineus	m	d	r
Micrelenchus tenebrosus	m	a	p
Murexul espinosus mariae	p	d	r
Murexul octogonus	p	a	p
Neoguraleus amoenus	p	d	c
Neoguraleus huttoni	p	d	r
Neoguraleus interruptus	p	d	p
Neoguraleus sinclairi	e	d	r
Nerita atramentosa	m	a	c
Nodilittorina antipodum	m	a	a
Notoacmea sp.	p	d	r
Nozeba emarginata	e	d	r

Odostomia chordata	p	d	r
Odostomia incidata	e	d	p
Ophicardelus costellaris	e	d	p
Paratrophon quoyi	m	d	r
Peculator hedleyi	p	d	r
Penion cuvierianus	p	d	r
Penion sulcatus	p	a	p
Phenatoma rosea	p	d	c
Phenatoma zealandica	p	d	p
Philine powelli	p	d	r
Philine umbilicata	p	d	r
Physastra variabilis	m	d	r
Pisinna semisulcata	p	d	r
Pisinna zosterophila	e	d	r
Poirieria zelandica	p	a	p
Polinices simiae	p	d	r
Potamopyrgus antipodarum	m	d	r
Potamopyrgus pupoides	m	d	r
Powellisetia subtenuis	p	d	r
Proxiuber australe	e	d	r
Proxiuber hulmei	p	d	r
Pupa kirki	p	d	p
Ranella australasia	p	a	p
Retusa oruaensis	p	d	r
Risellopsis varia	m	d	r
Rissoina achatinoides	p	d	r
Rissoina sp.	p	d	r
Rissoina zonata	e	d	r
Scutus breviculus	m	a	r
Seila terebelloides	p	d	p
Semicassis pyrum	p	a	r
Serpulorbis zelandicus	e	d	r
Sigapatella novaezelandiae	e	a	p
Sinuginella larochei	p	d	p
Sinuginella pygmaea	p	d	r
Sinuginella tryphenensis	p	d	r
Spectamen tryphenensis	p	a	p
Splendrillia aoteana	p	d	p
Splendrillia larochei	p	d	r
Stephopoma rosea	e	d	p
Struthiolaria papulosa	e	a	r
Struthiolaria vermis flemingi	p	a	c
Struthiolaria vermis vermis	p	a	c
Styliola subula	p	d	p
Suterilla neozelanica	m	d	r
Tanea zelandica	p	a	a
Taron dubius	m	d	r
Trichosirius inornatus	p	d	r
Triphora fascelina	p	d	r
Trivia merces	p	d	r
Trochus tiaratus	p	a	p
Trochus viridis	e	a	p
Tugali suteri	e	d	r
Turbo smaragdus	m	d	p
Turridae	p	d	r
Uttleya sp.	p	a	a
Veprecula cooperi	p	d	r
Xenophora neozelanica	p	a	r
Xymene ambiguus	p	a	p

Xymene gouldi	p	d	r
Xymene mortenseni caudatinus	p	d	p
Xymene plebeius	m	d	p
Zeacolpus delli	p	d	r
Zeacolpus pagoda	p	d	a
Zeacolpus vittatus	p	d	r
Zeacumantus lutulentus	m	d	p
Zeacumantus subcarinatus	m	d	r
Zegalerus tenuis	e	a	c
Zemitella sp.	p	d	r
Zemitrella choava	p	d	p
Zemitrella fallax	p	d	r
Zeradina ovata	p	d	r
Zeradina producta	p	d	p
Zethalia zelandica	e	d	r

BIVALVES	**Pakiri/M.B.**	**Alive?**	**Quantity**
Acer sandersoni	p	d	r
Anomia trigonopsis	e	d	p
Arthritica bifurca	e	d	r
Atrina zelandica	e	d	r
Austrovenus stutchburyi	m	a	c
Barbatia novaezelandiae	p	d	p
Barnea similis	m	d	c
Bassina yatei	e	d	r
Borniola reniformis	e	d	r
Chlamys gemmulata	p	d	a
Chlamys zelandiae	e	d	a
Condylocardia pectinata chathamensis	p	d	r
Corbula (Anisocorbula)zelandica	e	a	a
Crassostrea gigas	m	a	c
Cuna (Volupicuna) waikukuensis	p	d	r
Cuna aupouria	p	d	r
Cuspidaria trailli	p	d	r
Diplodonta globus	p	d	r
Diplodonta striatula	p	d	p
Divaricella (Divalucina) huttoniana	p	d	r
Dosina zelandica	e	d	c
Dosinia (Austrodosinia) anus	p	d	r
Dosinia (Phacosoma) subrosea	e	d	a
Dosinia lambata	e	d	r
Dosinia maoriana	p	a	a
Elliptotellina urinatoria	p	d	r
Felaniella zelandica	e	a	c
Gari convexa	p	d	p
Gari lineolata	p	d	p
Gari stangeri	e	a	c
Glycymeris modesta	e	a	p
Hiatella arctica	e	d	r
Hunkydora australica novozelandica	p	d	r
Irus elegans	m	d	r
Irus reflexus	m	d	p
Kellia cycladiformis	p	d	r
Leptomya retiaria	e	d	p

Limaria orientalis	e	d	r
Limatula maoria	p	d	p
Macomona liliana	m	d	c
Mactra ovata	m	d	p
Melliteryx parva	e	d	r
Mesopeplum convexum	p	a	a
Modiolarca impacta	p	a	c
Modiolus aerolatus	p	d	r
Musculista senhousia	m	d	p
Myadora antipodum	p	d	p
Myadora striata	e	a	c
Myadora subrostrata	p	a	c
Mylitella vivens vivens	p	d	r
Mylitta stowei	e	d	r
Mytilus edulis galloprovincialis	p	d	r
Neolepton antipodum	e	d	r
Notocallista multistriata	p	a	c
Nucula hartvigiana	e	d	p
Nucula nitidula	e	d	p
Offadesma angasi	m	d	r
Oxyperas elongata	p	d	p
Panopea zelandica	p	d	r
Paphies australis	m	a	a
Paphies subtriangulata	e	d	p
Parvithracia cuneata	p	d	r
Pecten novaezelandiae	p	d	a
Perna canaliculus	e	d	p
Peronaea gaimardi	e	d	r
Pholadidea spathulata	m	d	r
Pleuromeris latiuscula latiuscula	p	d	r
Pleuromeris paucicostata	p	d	r
Pleuromeris zelandica	e	d	p
Pododesmus zelandica	e	d	r
Poromya neozelandica	p	d	p
Pratulum pulchellum	p	d	a
Pseudarcopagia disculus	e	d	r
Ruditapes (Paphirus) largillierti	e	d	p
Saccella bellula	p	d	r
Saccostrea cucullata	m	a	c
Scalpomactra scalpellum	e	d	p
Serratina charlottae	p	d	r
Soletellina nitida	m	d	p
Soletellina siliquens	m	d	r
Spisula aequilateralis	p	d	p
Tawera marionae	e	a	a
Thracia vegrandis	p	d	r
Tiostrea chilensis lutaria	p	d	r
Trichomusculus barbata	p	d	r
Tucetona laticostata	p	d	p
Venericardia purpurata	e	a	a
Xenostrobus pulex	m	a	a
Zelithophaga truncata	m	a	r
Zenatia acinaces	p	d	r

CHITONS	Pakiri?	Alive	Quantity
Chiton glaucus	m	a	r
Chiton pelliserpentis	m	a	c
Craspedochiton rubiginosa oliveri	p	a	r
Lorica haurakiensis	p	d	r
Notoplax violacea	p	d	r
SCAPHAPODA			
Dentalium nana	p	d	r
NON-MOLLUSC			
CORALS			
Culicia rubeola	p	d	r
Monomyces rubrum	p	d	r
Sphenotrochus ralphae	p	d	p
BRACHIOPODS			
Calloria inconspicua	p	a	p
Terebratella haurakiensis	p	a	a
BRYOZOA			
Otionella sp.	p	d	r
ECHINODERMS			
Apotopyrgus recens	p	d	p
Astropecten polycanthus	p	a	r
Echinocardium cordatum	e	d	r
Evechinus chloroticus	e	d	r
Patiriella regularis	e	a	p
Spatangus sp.	p	d	r
CRUSTACEA - AMPHIPODS			
Allorchestes novizealandiae	e	a	p
Hyale sp.	p	a	r
CRUSTACEA - BARNACLES			
Balanus amphitrite	m	a	r
Balanus decorus	p	a	r
Balanus trigonus	p	a	r
Elminius modestus	m	a	p
CRUSTACEA - DECAPODS			
Calianassa filholi	p	a	r
Ebalia laevis	p	a	r
Eupagurus lacertosus	p	a	r
Helice crassa	m	a	p
Liocarcinus corrugatus	p	a	p
Paguristes pilosus	e	a	c
Pagurus sp.	e	a	p
Petalomera wilsoni	p	a	r
Plagusia chabrus	e	a	r
CRUSTACEA -ISOPODS			
Exosphaeroma obtusum	e	a	p
CRUSTACEA - OSTRACODS			
Cushmanidea sp.	p	a	r
Kotoracythere sp.	p	a	r
Leuroleberis zealandica	p	a	r
POLYCHAETES			
Hydroides norvegicus	p	d	r
Salmacina australis	p	d	r
Spirorbis sp.	p	a	r
SIPUNCULIDS	m	a	r

ALGAE			
rhodoliths	e	d	r
FORAMINIFERA			

Acervulina inhaerens	*Haynesina depressula*
Ammonia beccarii	*Lagena cf. koreana*
Amphicoryna scalaris	*Lagena striatospiralata*
Anomalina spherica	*Lagenosolenia* sp.
Astacolus australis	*Laticarinina coronata*
Bolivina cacozela	*Loxostomum karrerianum*
Bolivina pseudoplicata	*Massilina* sp.
Bolivina spathulata	*Miliolinella subrotundata*
Bolivina subexcavata	*Mychostomina* sp.
Bulimina gibba	*Nonionella flemingi*
Bulimina marginata	*Notorotalia depressa*
Bulimina submarginata	*Notorotalia finlayi*
Cassidulina carinata	*Notorotalia olsoni*
Cibicides marlboroughensis	*Oolina hexagona*
Cibicides sp.	*Oolina melo*
Cribrostomoides jeffreysi	*Patellinella inconspicua*
Dentalina sp.	*Pileolina zelandica*
Dyocibicides sp.	*Procerolagena* sp.
Elphidium charlottense	*Pyrgo anomala*
Elphidium excavatum s.l.	*Pyrgo depressa*
Evolvocassidulina orientalis	*Quinqueloculina ariminensis*
Fissurina claricurta	*Quinqueloculina colleenae*
Fissurina lucida	*Quinqueloculina lata*
Fissurina sp.	*Quinqueloculina parvaggluta*
Frondicularia bassensis	*Quinqueloculina patagonica*
Gaudryina convexa	*Quinqueloculina seminula*
Gavelinopsis hamatus	*Quinqueloculina suborbicularis*
Gavelinopsis lobatulus	*Sigmoidella kagaensis*
Globigerina bulloides	*Textularia ensis*
Globigerina falconensis	*Textularia* sp.
Globigerina quinqueloba	*Trifarina carinata*
Globigerinoides ruber	*Triloculina trigonula*
Globocassidulina canalisuturata	*Virgulopsis turris*
Globorotalia inflata	*Zeaflorilus parri*
Guttulina bartschi	
Guttulina yabei	
Hanzawaia bertheloti	

Natural science develops in direct ratio to the interest of amateurs

R. Tucker Abbott

Crosseola spp.

Acteon milleri &
A. cratericulata.

Unidentified species
found live

Balcis spp.

Uttlea spp.

REMEMBERING SCIENTIFIC NAMES

Part 2: The Genitive Case

by Frank Boulton

Introduction

In the first part of this series of articles, which aims at making the task of remembering scientific names easier, we learned that each genus name has a gender, which can be masculine, feminine or neuter. We also learned that the specific name can be an adjective, which must agree in gender with the genus name. We learned a few simple rules to determine the gender of the genus name in the majority of cases and how the endings of adjectival specific names change to show the gender of the genus name. Now we are going to look at another set of endings, which occur in specific names.

Nouns in the Genitive Case as Specific Names

When we look a noun up in the dictionary, it is listed in what linguists call the nominative case. Latin, Ancient Greek and English all have another case called the genitive case, which is used to denote possession. In English it is formed with the ending *-'s* or *-s'*. If we look at the various forms of a word like *man*, we find that there are four of them, i.e. *man*(nominative singular), *men*(nominative plural), *man's*(genitive singular) and *men's*(genitive plural). Although the formation of the genitive case is rather more complicated in Latin and Greek than in English, we can make our task very easy by selecting only those forms, which commonly occur. We can dispense with the Greek forms altogether. Of the Latin forms, we only need to concern ourselves with genitives of masculine nouns in *-us* and of feminine nouns in *-a*.

Masculine nouns ending in *-us* change their ending to *-i* in the genitive singular and *-orum* in the genitive plural. (Neuter nouns in *-um* have the same endings in the genitive case as masculine nouns in *-us*.) Feminine nouns in *-a* change their ending to *-ae* in the genitive singular and *-arum* in the genitive plural. We find the masculine singular genitive in *Margarella turneri*, the feminine singular genitive in *Buccinulum mestayerae*, the masculine plural genitive in *Hemiarthrum hamiltonorum* and the feminine plural genitive in *Calliostoma turnerarum*. You will be very pleased to notice that in situations where the genitive case is used it is usually tacked onto the end of a familiar surname. You will also notice that the ending of the genitive singular masculine is used far more frequently than any other genitive endings. This is because there are more species named after a single person, who happens to be a man, than are named after women or more than one individual. If you know whom a species was named after you can easily decide if the form of the name should be masculine or feminine, singular or plural. *Margarella turneri* was named after one man, *Buccinulum mestayerae* after a woman, *Hemiarthrum hamiltonorum* after two men and *Calliostoma turnerarum* after two women.

Notice that the gender of the noun in the genitive case is not determined by the gender of the generic name. In other words, genitives do not agree with the noun which they qualify. In this respect they differ markedly from adjectives and present fewer difficulties.

Greek nouns are usually latinized and then *declined* like Latin nouns. To *decline* a noun means to change its endings to form its different cases. Among the New Zealand mollusca I am aware of only a single instance of the occurrence of a genitive with Greek form in the subgeneric name *Delouagapia*, *Delou* being the genitive singular of *Delos*. This is one of Powell's names and he stands out as being remarkably sensitive to the structure and semantics of Latin and Classical Greek.

Subspecific names may also be nouns in the genitive case. They are to be treated in exactly the same manner as specific names, which are genitive in form.

By now you may be asking what the difference is between specific names such as *quoyi* and *quoyii*. The difference is quite arbitrary. *Quoy* is not a Latin name and so it has been latinized by tacking a Latin ending onto the end of it. When naming a species, some people think that *Quoyus* sounds better(giving the specific name *quoyi*) and others think that *Quoyius* sounds better(giving the specific name *quoyii*). Specific names with a single *i* are by far the commonest. So, you only need to remember the specific names ending in *-ii*. The rest can then be assumed to have a single *i*.

Occasionally, you will find specific names, which consist of two words written as one with the second being a noun in the genitive case. Examples include *Conus gloriamaris*(glory of the sea), *Conus stercusmuscarum*(literally "muck of flies", from the resemblance of its speckled markings to fly droppings), *Paphies alapapilionis*(wing of a butterfly), *Lopha cristagalli*(cock's comb). The *-is* of *gloriamaris* and *alapapilionis* is another genitive ending but it occurs so rarely as not to be worth committing to memory.

Summary

If this all sounds very complicated, then a simpler way of thinking about it goes like this. Most of the time we are dealing with a familiar surname with the Latin equivalent of -*'s* tacked on to the end of it. If the person after whom the species is named is a man then we usually add *-i* to the name and very occasionally we add *-ii* to it. If the person after whom the species is named is a woman, then we add *-ae* to the name. The plural endings are less important, because they occur less frequently. If the species is named after a group of men or a group of men and women, then we add the ending *-orum* to the name. If the species is named after a group of women, then we add *-arum* to the name. Genitive forms are easier than adjectives, because they do not have to be altered, when the generic name is changed.

And that is about all that you need to know about Latin grammar to make the task of memorizing scientific names easier. Isn't it a pity that those of us who studied Latin at school had to remember hundreds of pages of nouns, adjectives and verbs, when all we really needed to know could be explained in less than half-a-dozen pages?

AUCKLAND MUSEUM'S COLLECTIONS OF NEW ZEALAND LAND SNAILS AND BIVALVES NOW COMPUTERISED

Bruce W. Hayward
Curator of Marine Invertebrates

In 1991, staff of the Auckland Museum's Marine Departments designed and customised their own computer database for the collections using the relational database software package, Advanced Revelation. The aims of this project have been to:

a. computerise the data relating to all specimens in the collection to facilitate searching by locality, taxon, date, collector or any other data field or combination, and thus provide for much greater use of the collections;
b. make the generation of labels neater, standardised, and more efficient for specimens collected from the same locality;
c. use the computerised database to manage and track all loans and the use of the collections for displays;
d. allow specimens and localities to be linked to published articles and notes that refer to them;
e. attach data that monitors the condition of preservatives used for whole specimen collections.
f. integrate documentation of all marine and fossil collections in the Museum into a single database with a single numbering series.

The project has involved several phases so far:

a. Implement from late 1991, standard computerisation of all new incoming specimens, so that the back log no longer continues to grow.
b. Integrate all existing separate mollusc collections in the Museum into one systematically-arranged collection and rehouse in new compactor storage. Achieved 1991-1993 by a team of temporary and volunteer staff, mostly members of the Museum Conchology Section.
c. Computerise backlog of all existing collections of echinoderms, brachiopods, corals and tube worms (completed 1995, largely by Fiona Thompson, Nancy Smith and Cecilia Street).
d. Computerise backlog of all existing collections of fish, crabs, shrimps, barnacles and other crustacea (by Museum staff Ramola Prasad, Jenny Riley and Maggie Webb, mostly complete)
e. Computerise bulk collections of mostly smaller molluscs from numerous localities (completed 1995 by Rae Sneddon).
f. Check identifications, computerise and rehouse all wet collections of molluscs (completed 1994 by Margaret Morley, Norm and Noel Gardner, Peggy Town, Nancy Smith and Museum-funded Ramola Prasad).
g. Check identifications, rehouse and computerise collection of all New Zealand land snails (completed 1995, by Jim Goulstone with assistance of Norm and Noel Gardner and Lottery-funded technician Ramola Prasad). Jim Goulstone has been progressively adding his personal research collection of smaller land snails to the Museum database and collections.
h. Check identifications and computerise collection of all New Zealand bivalves (completed 1996, by Lottery-funded technician Ramola Prasad with assistance of Peggy Town and Rae Sneddon).
i. Check specimens against published descriptions, rehouse and computerise all holotypes, paratypes and equivalents in the collections (95% completed 1996, by Lottery and Museum-

funded technicians Nick de Carteret and Glenys Stace).
j. Check identifications of all New Zealand gastropods ready for computerisation (begun 1995 by Norm and Noel Gardner, Nancy Smith and Margaret Morley).

To Conchology Section members and the New Zealand molluscan community, the two most significant achievements so far, must be the computerisation of all collections of New Zealand land snails and bivalves. These are now much more easily searched and used. Remember this data and the specimens upon which it is based are freely available for use by all bona fide, non-commercial researchers, whether amateur or professional.

The Museum and all molluscan workers are indebted to the thousands of voluntary hours of work that has been put into the project to date by all the above-mentioned people, most of whom are well-known within the Conchology Section.

As of May 1996 the computerised database contains the following records:

43 000 specimen lots:
30 000 mollusc lots (containing 200 000 specimens)
16 000 New Zealand land snails
7 000 New Zealand bivalves
2 400 fossil lots
2 800 type specimen lots
1 500 holotypes

5 000 fish lots
4 500 crustacea lots
1 050 echinoderm lots
750 coral lots
600 brachiopod lots

The backlog to be computerised consists of New Zealand chitons and gastropods and all overseas molluscs - a task that will take us past the year 2000.

When in Doubt! - Uncertain or Provisional Status

Recommendations (quoted in toto from Bengtson 1988, Paleontology 31:226)

aff. relates a new undescribed taxon to a named taxon: e.g. aff. Agenus aspecies (for a new genus), Agenus aff. aspecies (for a new species), aff. Agenus aff. aspecies (for both a new species and a new genus).

cf. indicates that the identification is provisional: e.g. cf. Agenus aspecies (for a provisionally assigned genus), Agenus cf. aspecies (for a provisionally identified species), cf. Agenus cf. aspecies (for both a provisionally assigned genus and a provisionally identified species).

? indicates that the identification is uncertain: e.g. Agenus? aspecies (genus uncertain), Agenus aspecies? (species uncertain). Agenus? aspecies? (both genus and species uncertain).

sp. (or ssp.) indicates that specific identification is impossible or has not been attempted, n. sp. (or n. ssp.) that the species (or subspecies) belongs to a new species and cannot be associated with any known species.

'...' indicates that the name is obsolete in the immediate context of systematic interest: e.g. 'Agenus' aspecies (generic name obsolete), Agenus 'aspecies' (specific name obsolete), 'Agenus aspecies' (both generic and specific name obsolete).

These rules are intended to cover the great majority of situations where full identification is not possible. As is the case today, aff. and cf. will probably continue to be less commonly applied to genus-group names. (End of quote.)

AT THE END OF THE HOLLYFORD

Michael K. Eagle

The untouched beauty of the Fiordland National Park ranks, in area, among the largest in the world. Mountains soar from the crystal clear waters and waterfalls plunge from great heights into lakes and the sea and a network of valleys intersect the Alpine Fault. Meandering rivers, alpine plains, glaciers and mountain passes, river deltas, beach barriers and sheltered estuaries, provide stunning surroundings. Comparable also is the remote and often wild coastline annexed to both the rugged landscape and the South Tasman Sea. Such is the Fiordland coastline between Martins and Big Bays.

The Hollyford Valley is a glacier-carved imprint hosting the Hollyford River and it terminates in the truncated fiord of Lake McKerrow (Fig.1). Comparatively recent alluvial deposits from both the Hollyford River and Lake McKerrow have produced a mixed lowland rainforest delta at the western extremity, the southern end of which possesses a constricted winding estuary complete with a northward prograding sand spit. The Hollyford River spit

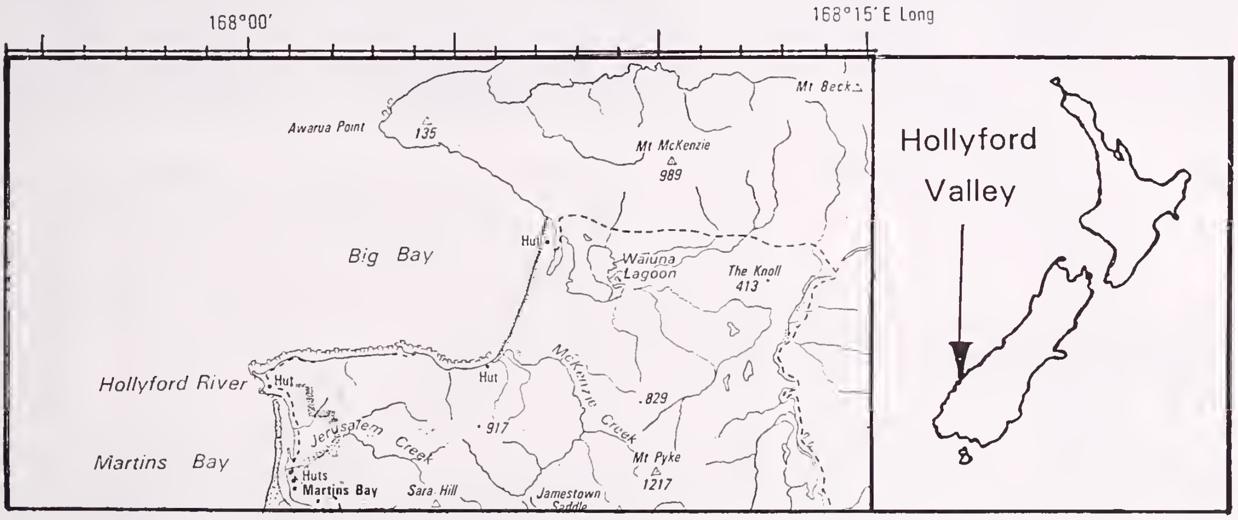


Fig.1. Map showing the location of Martins and Big Bays.

in the lee of the Darren Mountains is composed of white silica-rich sand complete with many small parabolic dunes. These are oriented to the prevailing south-easterly winds with a fetch originating somewhere in the Great Southern Ocean. The Hollyford River estuary (Fig.2) widens along the length of the bay hinterland with the eastern shore reaching into a rich understorey of coprosmas, wineberry, fushia and pepperwood, with abundant ferns, mosses and lichens. Coastal rata and flax attract woodpigeons, kaka, tui and bellbirds while fernbirds live in the swamp margins and bitterns hide in the fringing reeds. Ducks, swans, shags, gulls and terns live in the Hollyford estuary and the Kotuku or white heron, overwinters here. Schools of Hector's dolphins regularly breach the ever changing seaward Hollyford sand-bar to cruise Lake Mckerrow. Fiordland crested penguins nest in scrub and rocks near Long Reef. A thriving fur-seal colony also resides there amongst sculptured boulders of conglomerate, limestone, sandstone and granite (Fig.3). Occasional, predominantly quartz pebble beaches intersperse the long coastal boulder barrier that stretches from Long Reef to the long, sandy, beach expanse of Big Bay. The beach expanse at Big Bay is broken by both the Awarua River and McKenzie Creek.

Topographically, rocky shores such as those at Martins and Big Bays are more variable than other coastal habitats. The rugged, surf-churned, extensive boulder foreshore (Fig.4) is continuously exposed to waves mainly originating further south in the Great Southern Ocean. A high tide-line beach scavenge along this coastline produced species listed in appendix 1. Organisms living on open rock surfaces are obviously exposed to the rigours of the physical environment more than infaunal species inhabiting a soft sediment substrate. Fiordland's aquatic phenomenon of freshwater, weak peat-acid (derived from land run-off), floating on the seawater surface also contributes to shell surface pitting. This was readily apparent on most Polyplacopora and many Prosobranchia such as *Eudoxochiton* and *Cellana*. Abrasion and healed lesions were present on *Haustrum, Cellana, Lepsithais* and *Tanea* yet the occasional bivalve such as *Pseudarcopagia* and *Aulacomya* survived with both valves conjoined. Of note is the almost translucent glow associated with the golden shells of *Cellana*

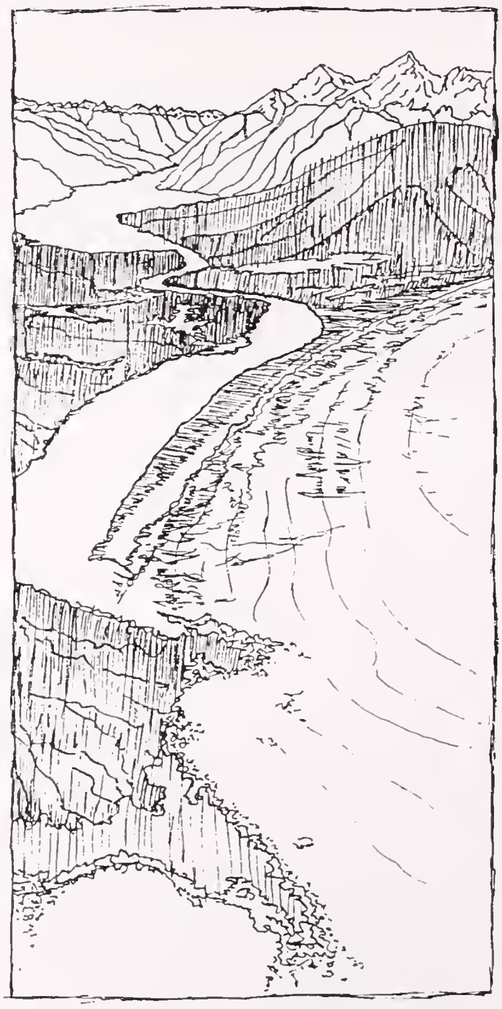


Fig.3. Schematic drawing of natural history aspects of the coastline: Fiordland Crested Penguin; White Heron; common fur seal; *Aulacomya alter maoriana; Cellana denticulata; Diloma arida;* Darren Mountains.

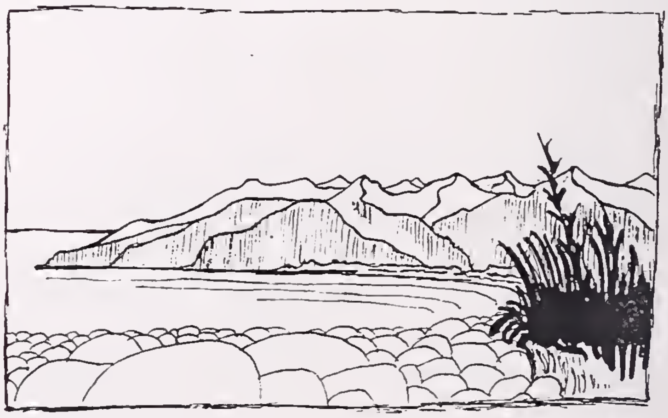


Fig.2. Line sketch of the Hollyford River estuary, sand spit and Hollyford Valley in the distance.

Fig.4. Line sketch of the boulder foreshore looking across Big Bay toward Awarua Point.

flava. One reason for this could be that they feed on the surface of limestone boulders scattered along the shoreline. The very small, heavily abraded, *Paphies australis* are obviously wash-outs from the Hollyford estuary where a semi-sheltered environment barely enables them to survive. It is suggested that substratum is often the most important factor in determining the distribution and adaptive characteristics of rocky shore benthic organisms on

this coast. An abundance of *Gadinalea conica* , both in adult and juvenile forms, indicates offshore caves and crevices and is typical of such a locality. A single specimen of the deep water species *Malluvium calcareus* (although badly abraded) is also not surprising. Of note is the fact that, although *Austrofusus glans* egg-case strings were collected, no shells were found. The usual upper littoral genera, *Melagraphia* and *Diloma* were plentiful and undamaged.

The appended species list highlights the large number of algal grazers (23) compared to filter feeding (6), and carnivorous (9) mollusca existing at this locality. The population of sessile or slow moving filter feeding/ algal grazing molluscs provide a large food resource (*Mytlidae; Patellidae; Acmaeidae; Trochidae)* for predators. Predators in particular are inhibited by prolonged tidal emersion. The high shore, therefore, is a suboptimal habitat for these prey species but constitutes an effective spatial refuge in which survival may be enhanced (devoid of the predator, *Stichaster,* the bivalve *Mytilus* here, prospers higher up the foreshore). Although only a tide-line collection, it was observed that mobile species (which probably compete for food rather than for space) appeared less likely to be predator-limited (very few shells collected were bored). The abundance of species may not reflect true populations, however, since different mortality rates may occur. This could be due to predation, food supply, longevity, seasonal changes in the environment and specific morphological characteristics, all of which may affect individual species. Observation suggests that the upper limits of this extreme physical environment therefore, appeared to be fixed by ecological rather than physiological factors. Since most marine species feed only when submersed, and large areas of boulder beach remain exposed for extended periods, reduced feeding time may also limit the extent to which some species are able to penetrate the upper tidal zone at this southern locality.

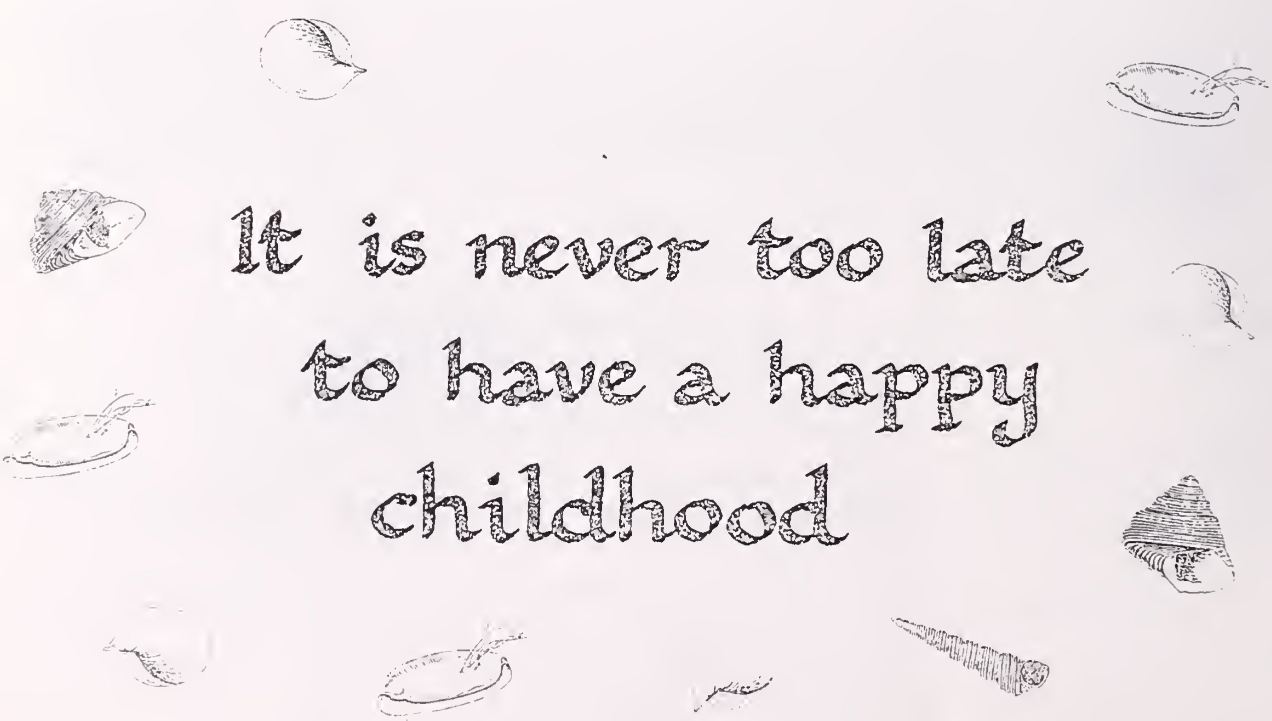
Acknowledgement: Kind thanks are due to Margaret Morely for her checking the molluscan species herein.

Reference: SPENCER, H.G. & WILLAN, R.C.
1995 The Marine Fauna of New Zealand: Index to the Fauna: 3. Mollusca. New Zealand Oceanographic Institute Memoir 105: 126p.

APPENDIX 1. Systematic list of molluscs from the rocky coastline between Martins and Big Bays, Fiordland National Park. Taxonomy follows Spencer & Willan, 1995 and recent updates (Morley *pers comm.).* Specimens are in the author's collection; species numbers are: A = abundant (10+); C = common (5-10); O = occasional (1-5); R = rare (1 only).

		BIVALVIA (6 species)	NUMBERS
MYTILIDAE	:	*Perna canaliculus* (Gmelin, 1791)	O
		Aulacomya atra maoriana (Iredale, 1915)	A
		Mytilus edulis gallprovincialis Lamarck, 1819	A
MESODESMATIDAE		*Paphies australis* (Gmelin, 1790)	O
		Paphies subtriangulata (Grey, 1828)	O
TELLINIDAE	:	*Pseudarcopagia disculus* (Deshayes, 1855)	O
		GASTROPODA (32 species)	
CHITONIDAE:	:	*Sypharochiton pelliserpentis* (Q & G, 1835)	O
		Chiton glaucus (Gray, 1828)	R
CALLOCHITONIDAE		*Eudoxochiton nobilis* (Gray, 1843)	O

HALIOTIDAE :	*Haliotis (Paua) iris* Gmelin, 1791	C
	Haliotis (Sulculus) australis Gmelin, 1791	A
FISSURELLIDAE :	*Scutus antipodes* Montfort, 1810	R
PATELLIDAE :	*Cellana denticulata* (Martyn, 1784)	A
	Cellana flava (Hutton, 1873)	A
	Cellana ornata (Dillwyn, 1817)	A
	Cellana radians (Gmelin, 1791)	A
ACMAEIDAE :	*Notoacmea elongata* (Q & G, 1834)	O
	Patelloida corticata (Hutton, 1880)	C
TROCHIDAE :	*Melagraphia aethiops* (Gmelin, 1791)	A
	Diloma (Fractarmilla) bicanaliculata lenior (Finlay, 1926)	A
	Diloma arida (Finlay, 1926)	A
TURBINIDAE :	*Cookia sulcata* (Gmelin, 1791)	C
	Turbo smaragdus Gmelin, 1791	A
CAPULIDAE :	*Malluvium calcareum* (Suter, 1909)	R
LITORINIDAE :	*Nodolittorina cincta* (Quoy & Gaimard, 1833)	C
NATICIDAE :	*Tanea zelandica* (Quoy & Gaimard, 1832)	O
RANELLIDAE :	*Charonia lampas rubicunda* (Perry, 1811)	R
	Ranella australasia australasia (Perry, 1811)	R
	Argobuccinum pustulosum tumidum (Dunker, 1862)	O
MURICIDAE :	*Haustrum haustorium* (Gmelin, 1791)	A
	Lepsiella albomarginata (Deshayes, 1839)	O
	Lepsithais lacunosus (Bruguiére, 1789)	A
	Xymene convexus (Suter, 1909)	O
BUCCINIDAE :	*Buccinulum vittatum littorinoides* (Reeve, 1846)	A
TRIMUSCULIDAE :	*Gadinalea conica* (Angas, 1867)	A
SIPHONARIDAE :	*Siphonaria australis* Quoy & Gaimard, 1833	A
	Siphonaria propria (Suter, 1909)	R
	Benhamina obliquata (Sowerby, 1825)	O



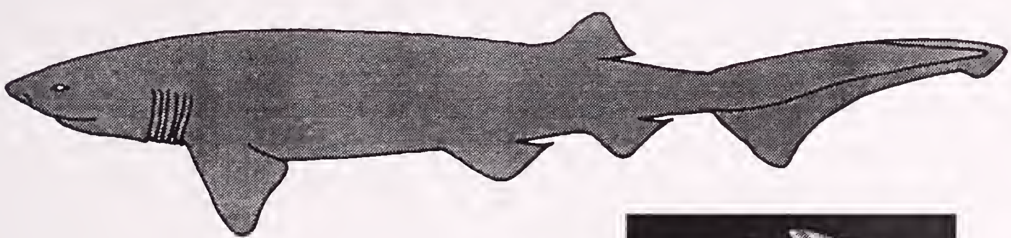
FOSSIL COW SHARK'S TOOTH

Hugh Grenfell

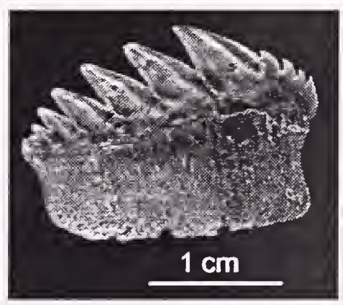
Shell Club members who went on a recent Geology Club field trip to Kaitarakihi and Huia will remember Murray Baker's unique find in a Parnell Grit unit within the Waitemata Group rocks we were exploring. Well, we have since had his find identified and we have also excavated a little to reveal more of this interesting fossil.

Ian Keyes (IGNS, Wellington) who kindly identified the tooth writes the following:
"The tooth that was collected from the Parnell Grit can be identified as *Notorynchus primigenius* (Agassiz). It is a member of the Family Hexanchidae which in living forms have 6 to 7 gill slits, and the nearest living relative of the fossil would be *Notorynchus cepedianus*, known as the "broadnosed 7-gill shark".
The tooth illustrated is a thin, blade-like lateral, with 5 of the crownlets showing. If you were to excavate it you would find the large principal crown to the right, bearing fine denticles at the base. It looks a good specimen so is probably worth excavating carefully.
This species is a Miocene form in most countries, but I have only seen a few good ones from New Zealand. Being fairly thin they frequently are broken in fossil deposits."

Subsequent excavation has revealed exactly what Ian described!



Living cow shark teeth



Kaitarakihi fossil cow shark tooth

Cow sharks are found worldwide in cold to tropical seas at depths to 1800m. They are widespread in the New Zealand region. Average size 4m. One species (*Notorynchus cepedianus*) is regarded as potentially dangerous to humans. They are described as cylindrical sharks with six or seven gill slits; subterminal mouth with large, blade-like, comb-shaped teeth in lower jaw and one dorsal fin (Paulin *et al.* 1989). Auckland Museum (in the Fish Hall) has a nice cast of *N. cepedianus* with a mouth full of these very characteristic teeth.
Murray has generously donated his fine specimen to Auckland Museum.

Reference:

Paulin, C.; Stewart, A.; Roberts, C. & McMillan, P. 1989: New Zealand fish - a complete guide. *National Museum of New Zealand Miscellaneous Series* No. 19.

HELICORNUM VERSUS TENELLUM

by Nancy Smith

Recently I was sent by my friend Jack Austin of Philipp Is, Australia, a parcel of Epitoniums which included 4 lovely big E. helicornum Iredale,1936.
These were a very welcome addition to my collection but looked very similar to my local Epitonium tenellum Hutton 1885, a common little brown Ep. washed up on the shores of estuaries and harbours where it feeds on the mudflat anemone Anthopleura aureoradiata (pers. comm. M.S. Morley)

Jack mentioned that the two were sometimes synonymised but said his references inclined to the view that there was a difference in rib count. Iredale in his original description says "this has been called tenellum Hutton, but that Neozelanic shell is smaller, and with fewer ribs and also narrower." Barry Wilson 1993, repeats this assertion but A.W.B.Powell 1979 gives E.helicornum as a synonym of E.tenellum and Suter in 1913 said of E.tenellum "also (found in) Tasmania and Australia"

Jack's shells were big by N.Z. standards, so I took out 4 of the biggest of my local specimens and compared them. Under the microscope they look identical. Took out the ruler....

HELICORNUM		LONG	WIDE	WHORLS	AXIALS
	1	16.7	7.6	6	16
	2	14.1	7.0	6	21
	3	14.6	7.0	6	18
	4	15.35	7.5	6	18
average		15.2	7.3		18.25
TENELLUM					
	1	14.7	7.4	5	23
	2	16.2	7.5	6	24
	3	15.4	7.7	5	22
	4	16.1	7.6	5	23
average		15.6	7.55		23

The whorl count does not include the protoconch as none of the Australian and only one of the N.Z. shells had a complete one. The whorl numbers are doubtful as without a full protoconch it is hard to be positive.

The N.Z. shells tended to have more thick varix-like axials than the Australians but this was hard to count as some of them under the microscope showed as two fine ribs close together, others as heavy varices and I could not determine a dividing line between fine and thick. The smaller E. tenellum in my collection do not show this characteristic so obviously.

Conclusion? Well, E. tenellum does not seem to be smaller or narrower than E. helicornum and so far seems to have more axial ribs rather than less! I think they are the same species. Stop me if you have heard this one before, but until some one examines the animals who will know the truth?

Refs:- Wilson Barry, 1993 Australian marine Shells, vol.1
Powell,A.W.B. 1979 New Zealand Mollusca
Suter Henry,1913 Manual of the New Zealand Mollusca

PERIODICALS:- from Nancy Smith

Basteria Vol.59 parts 1-3, pp1-88

A new species, *Nassariusi moolenbeeki*, closely allied to *N. callospira*, is named by Hugo H. Kool. Differences are described and *N. moolenbeeki* is limited in range to the Western pacific.

A new series on taxonomy of Recent Pectinidae starts with clarification of the epithets *aurantia(us)* and *aurantiaca(us)*. A new name and a lectotype are designated by Henk H. Dijkstra.

Prof. Dr. E. Gittenberger has been investigating the land snails of the mountains of the Peloponnese. A new name is given by B. Hausdorf.

Remnants of a (colour) pattern have been found on a Pliocene bivalve shell, *Pseudomussium (Palliolum) gerardi* (Nyst,1835). This is considered rare and possible reasons discussed by W.J.van der Burg.

Twelve new species of the genus Mastus (Gastropoda Pulmonata: Buliminidae) from Crete (Greece) are included in observations by W.J.M. Maassen. Illustrated with detailed drawings of the internal organs.

In a survey of species of Philinidae (Gastropoda, Opisthobranchia) dredged during the CANCAP expeditions off the WestCoast of Africa, 5 new species are described by J.van der Linden.

The Nautilus Vol.109, Numbers 2 and 3

A "Revision of the Supraspecific Classification of Marginelliform Gastropods". The authers, Holly K. and Gary A. Coovert, have studied all available information on recent and some fossil species. Shells have been examined internally as well as externally and animals have been dissected concentrating on the foregut and radular morphology. It is concluded that the Cysticidae is a valid family not closely related to the Marginellidae but has a common ancestry with the Olividae. The Marginellidae is considered to be related to the Volutidae. Some new Genera are described and "a systematic section lists synonyms and type species of each genus".

Levantina No.81, Dec.1994

3 articles from Henk Mienis; " Molluscs from the excavation of Khirbet Deiran (Rehovot) Israel," "Three descriptions of *Argonauta monterosatoi*" elucidating the taxonomy, and "Type specimens of Mollusca in the collection of the Hebrew University of Jerusalem, 6. The genus Ranella Lamarck,1816 (Ranellidae)".

B.S. Singer & D. Korkos describe an "Invisible danger amongst the corals..." experienced by a diver in the Gulf of Aqaba where there have been a few unexplained drownings.

B.S. Singer has 2 more articles; "Awareness and reaction of species of Strombus to the proximity of a dangerous enemy" (various cones) and "On sorting through shell grit from the Gulf of Aqaba" describes Mr Singer's method of examining micromolluscs.

Along with our Levantina we received Haasiana No.1. This substantial volume is the new Newsletter of the Hebrew University of Jerusalem "dedicated to informing you about the Scientific Collections of Natural History in Israel".

Congratulations to Nancy Smith, winner of a beautiful and unusual specimen shell. She was the only correct entry in our crossword competition.

For all our crossword buffs. Here's the solution.

A	T	H	O	R	A	C	O	P	H	O	R	U	S		S	N	A	I	L
C			R		R		K			L		R			U		I		A
A	C	H	A	T	T	N	E	L	L	I	O	A	E		B	A	N	I	O
N			T		O		N			V		N			R		U		M
I	A	R	O		N	A	T	L		L	R	O	S	I	O	N		L	A
H			R	O	T		A			S		P			S			I	
O	M	N	T		O	A		O	R			S	T	A	T	I	C		T
C			O			R		B			C				R		O	P	O
H		A				C	O	C	H	L	O	P	I	N	A		O		R
I	S	T	H	M	U	S		O			M				T		K	I	N
I	O	R		U				N			F		A	M	A	N	I	T	A
O		T		R	H	Y	T	I	O	A	R	E	X				A		I
N	U	N		O				C			E		E			O			L
A		A	V	O	U	C	H			M	Y		E	M		I	O	O	L
	R			C			U		R			A		O	T	L			L
V	T		S	H	T	A	T	S	U		W	R	E	N		A	B	R	I
A		A		E			T		G			A		T		I			N
L	T	B	L	L		M	O	N	O	O	O	N	T	A	E	A	B	I	O
V		E		E			N		S			L		G		I			P
E	S	T	E	A		B	T	T	E	N	T	A	C	U	L	A	T	U	S

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CONTENTS

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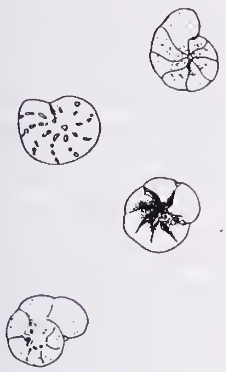
Sermon from Sand.

by John Morton

Sand has a pretty Latin name Harena, they talked about carae harena, golden sand, but harena nigra was 'slime' or mud in Virgil. And sand generally has been accounted like the 'vile dust' merely for treading under our feet. That is how it's name was given to arena because it's floor was strewn with sand.

We're reminded of G.K.Chesterton's fine little verse In Praise of Dust:



"What of vile dust? the preacher said
Methought the whole world woke
The dead stone lived beneath my foot
And my whole body spoke.

You, that played tyrant to the dust,
And stamp its wrinkled face,
This patient star that flings you not
Far into homeless space."

Tonight's talk was suggested by a notable article in Poirieria on the Pakiri sands brought to Mission Bay and the real questions this raises in a resource-obsessed society, of our ethic and duty towards a creation beautiful beyond our knowing. It could be because we in fact hardly knew about it at all.

SAND AND IT'S GENESIS - The nature and Origin of sands.

There are not only " sermons in stones", but history in the colour and composition of a pinch of beach sand. Studied under a binocular microscope, the array of particles can be revealing.

The mineral grains are usually the largest component. When greywacke weathers, it's feldspar (aluminium silicate) element is rotted to form the kaolin of clay. The more resilient grains of pale quartz remain and become smoothed and polished. There are also the ferromagnesian minerals of dark hornblende, chlorites and biotite mica. These dark grains are much more evident when volcanic basalt and andesite are weathered. Our whitest, most quartz-rich sands are a legacy of history. Almost all that is present today has come from the acidic lava rhyolite that was brought up from the central North Island when the Waikato River once flowed into the Gulf. This white sand is still periodically removed and returned to beach slopes by waves with different directions of the wind.

West coast sands have the black grains of the iron ore magnetite, carried north by alongshore currents from Mt Taranaki. These black sands lighten north of Auckland, with progressive decay and the leaching of the iron compounds, leaving pale quartz and shell.

Estuarine sands have a large organic input from land derived particles. These include colloidal clays and organic material, oxidised to brown at the surface, but darkening with ferrous sulphide a few centimetres down. An important addition to these mineral grains comes from the chips of pulverised bivalve shells.

Our most colourful beaches are the moderately open slopes, with coarse-grained, high level sands, such as those at Tawharanui, Omaha Spit, Goat Island Bay and north of Mangawhai. Rich in dark ferromagnesian grains the sand is sometimes pink from fragmented shells of Tawera, Umbonium, and, particularly, the barnacle Balanus. A common constituent is dull green, made up of eroded fragments of sea urchin.

Mangawhai, Pakiri or the Spit at Omaha, the beds off-shore are of clean, well-sorted quartz sand. Prettily rayed and zigzagged dawn shell (Tawere spissa)(tawera is the Maori name for dawn) come in by the thousands from the sub-tidal sand. As well, the beach is often pink with small wheel-shells (Umbonium zelandicum). This species lives in thousands just below the surface of sub-tidal sand.

Every north-easterly blow brings in a wealth of molluscs, seldom seen alive at other times. At Pakiri and Mangawhai, there will be fragile sand-whelks (Austrofusus glans) and perhaps the occasional shell of New Zealands biggest gastropod, Tonna cerevisina, broken or even entire. Volutes (Alcithoe arabica) and helmets (Xenophalium) also turn up regularly. Bream Bay, north of Mangawhai Heads, is specially renown for strewn piles of struthiolariid shells (of which there are two species - the large Struthiolaria papulosa and the smaller Pelicaria vermis, often washed up alive. Truly living fossils, their ancestors came to New Zealand in the Jurassic period from the then cold-temperate Antarctic. Like the wheel-shell Umbonium and the turret shell Maoricolpus, They feed on fine organic deposits collected by the currents created by the cilia on their gills. But on these beaches, bivalve shells far outnumber the gastropods.

COMMUNITIES: There are different size levels at which we can pursue the communities of sand. The Waitemata Harbour Survey, repeated 60 years after Dr Powell, shows how labile and dynamic, over time, such a community, in this case part humanly assisted, can be. It necessarily, for comparison with Powell's original, examines only to animals of macro size that can be caught in a grab, or won't pass a sieve. Then at a second level, comes your own Pakiri/Mission Bay study with species down to 10mm or a little more.

There is a smaller sand community still. I am thinking of the interstitial fauna that occurs well within tides, as at the beach step quite high up the shore that you can see at Cheltenham. Here there are rather coarse grade particles of shell sand, clean and relatively mobile. At every wave break during high tide, water pours over the surface, and seeps freely down through the interspaces between particles. the interstices are thus kept clean and well aerated, receiving a constant supply of detrital food.

It was the pioneering work of Derek Challis, my research assistant from 1950 - 1960, to study one of these habitats in N.Z. while still an undergraduate. He then came with me to the Solomon Islands in 1965, and made a study of the the interstitial communities of coral sand, published in two papers (Phil. Trans. Roy. Soc. B vol. 255, pp517-539.)

Transport of hundreds of thousands of cubic metres of living Pakiri sand rich in molluscan and other communities, to dump it above L.W.M. on Mission Bay raises intriguing questions - not less biological or economic, in that they are also philosophical and even moral. Your group has found a rich treasure trove of Pakiri shells, like finding crown jewels in unimagined profusion strewn over the pavement after a smash and grab raid. Rather remarkably, you have been able to list all these

species and to prepare a high grade scientific and conservationist paper. The existence of amateurs with such skills could be one of the indices of our stage of civilization. It is a resounding justification for biologists to stay with natural history and be able to know the whole host of these little cattle by their names. Taxonomy is like Jacob's wrestling with the angel, not letting any of these entities go until the names are known.

What have the names revealed? First, the sheer richness of a community few knew anything about. It is a terra incognita that was not able to be sampled properly in Morton and Miller days. Lying just below wave- break line at low water, this community is tantalisingly near; to naturalists, inaccessible. It is one of the least known and understood communities and one of the least humanly linked or seemingly relevant.

This very fact is sobering; that there should be reaches of creation so remote from human economic rapport or perceived aesthetic appeal. Where the Resource Management Act regards the natural world as a resource to be husbanded and conserved, even as the Litany thought of "the kindly fruits of the earth as blessed to our use, that in due season we may enjoy them" - we can think of few manifestations of nature having less relevance than the complex sand communities.So it is disconcerting to find there is so much going on that our own species is unconscious about, in his busy, sometimes frenzied, economic concerns.

This sand community is a testimony to the prodigious richness of the seas, which natural theologian Richard Hooker called "harmoniously confused." Wherever salt water reaches there seems to be life, itself destined to "espouse the everlasting sea". The sea even reaches to ourselves, in the scarlet tree of our blood circulation; here is a little enclave of the sea, only weakly saline - as the Paleolithic sea was when our ancestors climbed out and brought some of it with them.

By contrast, without reach of the sea, sand will be almost (not quite) a desert; with only a few pale peracarid crustaceans recovered from it by pumping for days on end. Almost as thinly inhabited as the river sand from Mercer on the Waikato, where our whole supply of Hauraki Gulf siliceous sand came with the Waikato from the rhyolitic central North Island. With the diversion of the Waikato now closed off from the Gulf there will be no more.

But where saltwater percolates, as in the interstitial spaces of sand, there it is that life is initiated. Almost as the Platonists would say - the formless and featureless dead matter (Hyle) is being ensouled, as Zoe is imparted to it.

The question is, when such exquisite systems are brought to our hitherto unsuspecting attention, what are our obligations to them? What title of respect does it deserve from us? Had we not known what we were doing, we might still have then been exempt from blame as we were in our comparative innocence when we first began to spew from our industries all those green-house gases or the ozone destroying CFC's.

We are no longer so primally innocent. We have knowledge; and that should impose constraints. There is a moral sense that seems to confront us with duties - even with loving engagement towards such an extended creation. There may surely moreover, be a consensus within reach that our obligation to nature is not just subjective at our own feeble or fickle impulse. There could be a sense of treading on holy ground. The beauty of the system could be its sufficient title to our regard. That could be how we develop a moral awareness from the beauty of worthiness, from the

dignity to which it is directed. Remember that "dainty" can impart dignity, they were once the same word.

This is where the calculations of the resource economist breaks down. We can give up calling all nature a resource or imagining it has to gain its dignity from our condescending. As I understand it, even a taonga in a heritage sense is cherished as a resource that has to mean something needful to us. Like keruru, held to be a taonga because some Maori people assert the right to harvest and eat it. But a threatened species,_huia or piopio yesterday, keruru today, may stand in real danger that can be effectively measured, regardless of the ethnic status of its harvesters. Extinction, whoever may have brought it about, is final and irrevocable.

We would seem to have discovered with this natural community a new and binding ethic, not individual but communal. With turning Southern beech into chips for paper, or with the prowess of youth scaling a cliff for the chick of royal albatross for a traditional feast, or bringing black coral to the surface to dry out and put on the mantlepiece. These are examples of things that you simply don't do.

Perhaps we ought to think of an environment morality not in terms of debt (debeo = I ought to) but as decet = it is decent or becoming. Like throwing litter in a public place, we used to be taught "it simply isn't done". We find the old Romans had a stronger notion of public morality; against the treading on or desecrating "sacred ground", embodied in a special word NEFAS (noun indeclinable) that meant an impious deed or something contrary to divine law.

With all this, do I stubbornly maintain a natural community should remain sacrosanct, like traditional Indian cattle, with never a hand laid on it? Spare such a fanatic thought! A human conscience constantly has to make a whole scale of decisions. Decisions about a species or a community will be better informed when we know how rare or how fragile it is, like keruru, or capable to some extent of harvest as sooty shearwater or kina. The test must always be about real, and always reasonable, utility, with the proviso that we do not act wantonly only, and try our best not to act ignorantly.

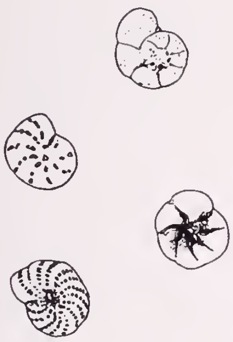
The reproach will not be in itself the causing of death to living creatures. Death is the one finale that we, along with all living beings, can be certain of. Matthew Fox has reminded us that when a goat is killed for its meat or because someone needs its skin for a coat, we ought gratefully to acknowledge the sacrificial quality of the death we are inflicting.

Two centuries ago, the naturalist J H Fabre recalled with true pleasure the time he had first been shown how to dissect a wood-snail, I can equally remember the first frog I dissected, just into my teen years, with the cutting of the peritoneum finding the way into an unexplored world of exquisite shapes and colours. I can truly believe that frog, and a whole line of animals, culminating in my sand-beach Strutholaria, were sacrificially expended, and that a reverent intention of study or research can be a motivation in good conscience.

Back to Pakiri and its "living sand" It can, I believe, be decent and in good conscience to want to gain access to its species and to take delight in their study. Where otherwise would all the wrestling and naming get done that is the learned trade of systematics and taxonomy? The test is, what is seemly? and how much is enough? Is it really difficult to make a distinction between using Pakiri sand for molluscan taxonomy, and using it by the hundred of tonnes to dump on a beach or make filling for cement.

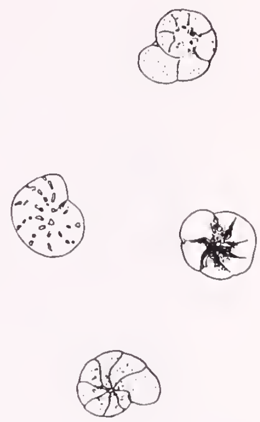
In Sir Thomas More's republic of Utopia, the citizens were used to making judicious public provision for worthy ends: not only libraries and music and gardens, but even daily communal dinners. Would it be too Utopian to think of making a public provision of just sufficient quantity of Pakiri sand, perhaps once in a lustrum (5 years) for the benefit of Auckland malacologists of all ages and degree, bringing it back carefully and perhaps spreading it out behind the Museum on the lawn near the public car-park. An elder and erudite form of "hands on" display, with full permission to "take away".

We would above all never wantonly destroy. For some, there might be nefas or impiety in flame-scorching a country road-side verge, with the pale yellow of flowering fennel, red of Montbrecia, and the fine lace of wild carrot.
For G.K.Chesterton has something more to say:



"The flowers that at your sermon's end
stand blazing silently
Rich white and blood-red blossom; stones
Lichens like fire encrust;
A gleam of blue, a glare of gold,
The vision of the dust.

When God to all his paladins
By his own splendour swore
To make a fairer face than heaven
Of dust and nothing more."



More on Mission Bay Sand

Margaret S. Morley, Fiona Thompson, Nancy Smith,
Glenys Stace and Bruce Hayward

People are still collecting and identifying molluscs from the Pakiri sand. Dumping has now stopped, but additional species are likely to be washed out of the sand for many months yet.

We are now able to add 26 gastropods, 8 bivalves, 2 chitons and a scaphapod to the list published in the last Poirieria. *Fissidentalium zelandicum* is a deep water dentalium seldom found washed up. (The more common *nanum* has had a name change to *Antalis nana.*) The *Paphies ventricosa* appears to be of the same subfossil origin as the *Anadara trapezia* and *P. subtriangulata* mentioned in the last edition of Poirieria.

Fiona Thompson's live taken bivalve (see illustration in previous Poirieria), has been identified as *Parilima neozelanica* (Suter, 1914). Bruce Marshall warns that this name may need revision. This species is not included in Powell 1979, but is in Beu & Maxwell P. 346, Pl. 46. Some shells have been identified to genus level only. The Aneators are proving puzzling with probably two, possibly three species. It is not certain that there are two species of Acteon. We hope that, as more specimens are found these identifications will be confirmed.

Quite a few additional shells are microscopic and there will no doubt be more of these as people have time to work on them.

Additional Species List:

KEY:	Most likely source:		r=rare 0-4
	p: Pakiri	a=alive	p=present 4-15
	m: Mission B.	or	c=common 15-30
	e: either	d=dead	a=abundant >30
GASTROPODS	Pakiri	Alive?	Quantity
Aeneator marshalli separabilis	p	d	p
Attenuata finlayi	p	d	r
Bouchetriphora pallida	p	d	r
Brookula finlayi	p	d	r
Cirsonella aff. *laxa*	p	d	r
Cirsonella consobrina	p	d	r
Eulimella coena	p	d	r
Haliotis australis	p	d	r
Homalopoma nana	p	d	r
Leuconopis obsoleta	m	d	r
Liotella rotula	p	d	r
Liratilia conquista conquista	p	d	r
Melanella bollonsi	p	d	r
Monophorus fascelina	p	d	r
Murdochella levifoliata	p	d	r
Nassarius aoteanus	p	d	r
Neoguraleus murdochi	p	d	r
Notoacmea subtilis	p	d	r
Obexomia densilirata	p	d	r
Philine auriformis	p	a	r
Polinices simiae	p	d	r
Rissoina achatina	p	d	r
Siphonaria australis	m	d	r
Striodostomia orewa	p	d	r
Zemitrella pseudomarginata	p	d	r
BIVALVES			
Acar sociella	p	d	r
Anadara trapezia	p	d	r
Crenella radians	p	d	r
Lasaea hinemoa	m	d	r
Mactra murchisoni	p	d	r
Paphies ventricosa	p	d	r
Talabrica bellula	p	d	r
Volpicuna mayi	p	d	r
SCAPHAPODA			
Antalis nana (name change)	p	d	r
Fissidentalium zelandicum	p	d	r
CHITONS			
Leptochiton inquinatus	e	d	r
Acanthochitona rubiginosa	p	d	r

An Overview of the Genus *Paphies* in New Zealand Fossil Record

by Glenys Stace

Introduction: Records of the Genus *Paphies* are sparse in the fossil record prior to the Wanganui Series, Nukumaruan Stage, (Late Pliocene, about 2.5 million years ago). This article attempts to record the occurances of *Paphies* in the New Zealand fossil record, including those in published records not clearly identified or named.

The present taxonomy of the genus *Paphies* in New Zealand. (Beu & Maxwell, 1990)[1] is:

CLASS: BIVALVIA
SUPERFAMILY: MESODESMATACEA
FAMILY: MESODESMATIDAE
GENUS: PAPHIES (Lesson, 1831)
SUBGENUS: PAPHIES
anteaustralis (Dell, 1950)
australis (Gmelin, 1791)
crassiformis (Marshall & Murdoch, 1920)
donacina (Spengler, 1793)
porrecta (Marwick, 1928)
subtriangulata (Wood, 1828)
ventricosa (Gray, 1843)

Beu & De Rooij-Schuiling (1982)[2] examined the holotypes and defined the classification of the two living species of tuatua in New Zealand. Their synonomies are accepted for the purposes of this article. Dates for the Taranaki & Wanganui Series used in this article are from "An interim New Zealand geological time scale", IGNS, 1995.[3] (Appendix.1)

PIPI

Paphies (Paphies) australis (Gmelin, 1791)

Paphies australis (Gmelin, 1791) has the longest and clearest occurrence in the New Zealand fossil record. The recent species, still abundant in our estuaries is common at Castlecliff and Nukumaru (Castlecliffian & Nukumaruan, 0.4 - 2.5 my). They occur frequently in the Kaawa faunule (Opoitian, 3.6 -5 my) and feature in the record from the Otahuhu Brewery Well, slightly younger than Kaawa Creek.[4] There are specimens in the Auckland Museum collection from Petane, Hawkes Bay; Bluff Hill, Napier; and Landguard Bluff.

Paphies (Paphies) anteaustralis (Dell, 1950)[5] .

The next appearance of *Paphies* clearly identifiable with *P. australis* is Dell's specimen *Paphies (Paphies) anteaustralis* Dell 1950, from Waikowhai, Manukau Harbour (Po Otaian, ? my).Described from one small valve, the specimen is clearly of the genus *Paphies* and allied to *P. australis.* Dell comments on the shape being slightly different from recent specimens and more similar to a small adult than a juvenile. (Fig. 2).

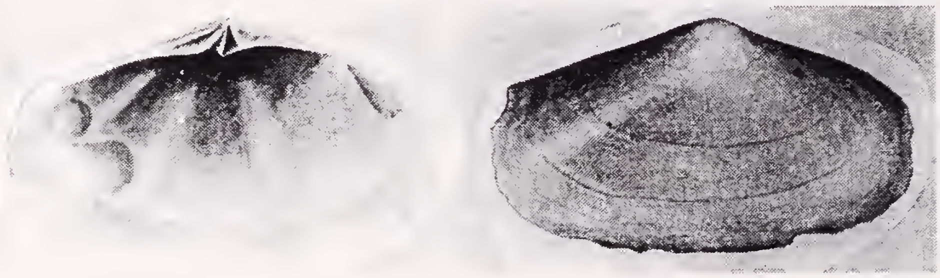
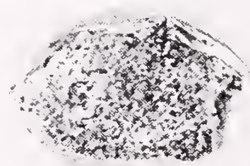


Fig. 2, Holotype of *Paphies anteaustralis*

In October 1995, Mike Eagle found another specimen at Waikowhai, still embedded in matrix. It clearly supports Dell's conclusions. I believe it is only the second specimen to be found from the type location. Another Miocene specimen was found in April 1995 at Church Bay, Waiheke Island. Both ends are abraided, but the hinge and dorsal margin are clearly *P. anteaustralis* (Fig. 3).

Fig. 3, Specimen of *P. anteaustralis* from Waiheke Island.



TOHEROA

Paphies (Paphies) ventricosa (Gray, 1848) Fig. 4.

Smaller toheroa have sometimes been confused with both tuatua species but unlike the two tuatua species are always distinguishable by their lightness of shell, their distinctly curved ventral margin, a double posterior flexure and a pallial sinus reaching almost to the centre of the shell. Older, larger specimens can be quite heavy, but are larger than any known tuatua. They are distinctly narrower at the posterior end than the anterior.

Very large (170mm) shells regularly wash up on the Northern Beaches although there is no record of toheroa of that size having lived there. Cassie (1950)[6] had one of these shells from Muriwai beach carbondated. The record in Ferguson & Rafter states:

" 115 R212 R.M. Cassie

Toheroa shells from sub-fossil deposit behind fore-dunes, 10 miles north of beach road. These shells are larger than contemporary shells, possibly belonging to an extinct race.

Age - years before 1950 1,030 +/- 60"

It is doubtful that these specimens belong to "an extinct race". It is easy to immagine the large, mature specimens living today on Oreti Beach, left alone to mature further, attaining such size. It is more likely that the environment has changed significantly, so that their preferred niche now occurs further south.

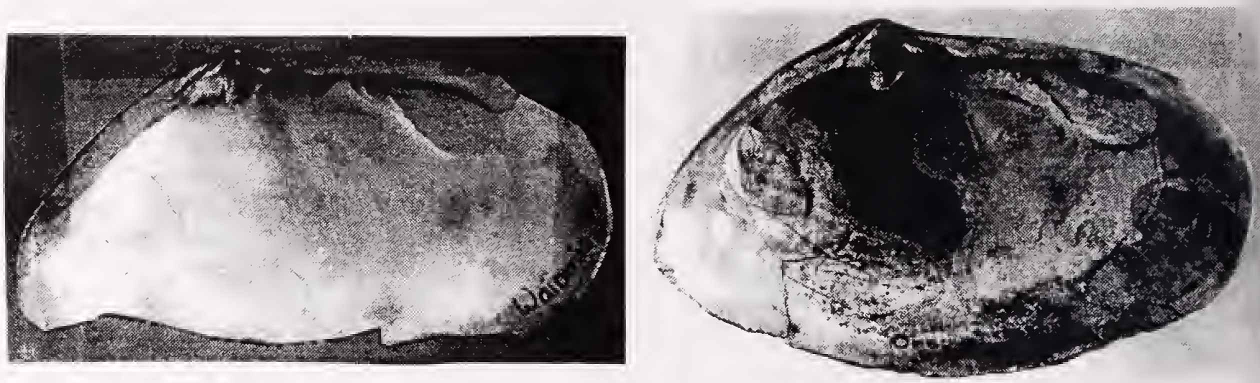
Fig. 4, Holotype of *P. ventricosa*, reduced x 0.5

Paphies (Paphies) ventricosa (Gray, 1843) Pleistocene

The only fossil *P. ventricosa* recorded are from the Onepuhi Shellbeds and the Waiomio Shell Bed (Castlecloffian 0.4- 1.6 my), Rangitekei Valley. On first examination, the shells appear identical to modern specimens with the exception that the larger one from Onepuhi appears slightly more inflated, and has a more pronounced point at the anterior end. However , there is such variation in the shape of the larger Recent specimens that it would be hard to determine a "definitive" shape. On comparison with a variety of modern shells, no consistent difference could be found and it appears almost identical to a specimen in the Auckland Museum collection from Dargaville Beach (1964),(Fig. 5).

The most notable feature is that they are all comparable in weight to recent specimens of about the same size and lighter than the sub-fossil specimens found on the Northern beaches. These three specimens are the only *P. ventricosa* in the fossil record. The situation in which they live is rarely preserved.

Fig. 5. Fossil Specimens from the Rangitikei, reduced x 0.5



TUATUA

Paphies (Paphies) subtriangulata (Wood, 1928)

The taxonomy of this species was examined in detail by Beu& De Rooij-Schuiling (1982), They list thirty-five synonyms and other published combinations.Their illustrations of the various type specimens clearly confirm Powell's description, which I repeat here, as there is always considerable confusion between the northern species, *P. subtriangulata* and the southern species *P. donacina* (Fig. 6.).

"Shell large, thick, solid, wedge-shaped, the posterior end truncated and ridge-margined. White under a thin yellowish periostracum, usually largely worn off."[7]

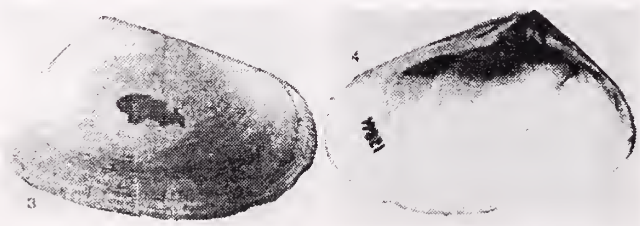
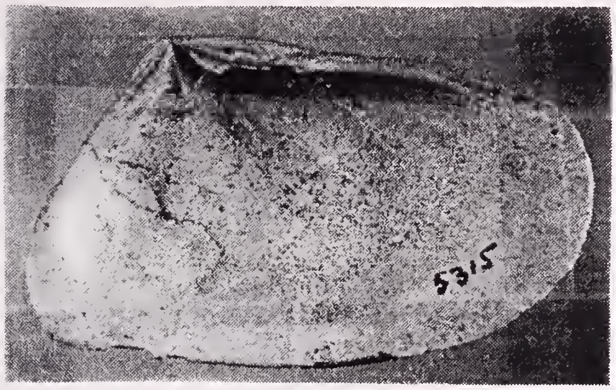


Fig. 6. *Paphies (Paphies) subtriangulata* probable holotype of *Mactra subtriangulata* Wood, 1828

Mention should be made here of the numerous, heavy, sub-fossil *P. subtriangulata* to be found in shell banks around northern New Zealand. I have in my collection many extremely heavy examples from The Bluff, 90 Mile Beach with the hinge almost resembling *P crassiformis.*. They were found in association with the very large, old toheroa shells that are occasionally found all down the West Coast mentioned earlier. I have similar specimens from Long Bay, Auckland, Pakiri and recently collected similar examples from beds overlying the basal greywacke and covered with Holocene clay, at Waitete Bay, Coromandel. It would be useful to have these shells C14- dated. as it would be of interest to correlate the shape and heaviness of their shells with factors such as water temperature. They contrast markedly with the lighter specimens discussed under *P.*

donacina, dredged from Colville channel, and from specimens found in Maori middens, which appear quite light in comparison.

Specimens clearly allied to *P. subtriangulata* have been found in the Brunswick Pebbly Sand at Mt Jowett, Wanganui (Haweran < 0.4 my), and at Clifton and Maraetotara, Cape Kidnappers, (Castlecliffian 0.4-1.6 my). (Fig. 7)



Maraetotara

Clifton, Cape Kidnappers

Mt Jowett

Fig. 7, *P. Subtriangulata* specimens in NZGS collection from Mt Jowett, Clifton and Maraetotara

The Otahuhu Brewery Well (Wo, 3.5-5 my) yielded numerous examples which Laws, 1950[8] describes as "stoutly built and essentially very close to *subtriangulatum*, but all quite small."

Paphies aff. subtriangulata of Eagle 1993 [9]

Eagle describes a "Single valve specimen of the Mesodesmatidae tentatively assigned to *Paphies* which was found in the Otaian (approx. 22 my), sandstone clast at Hays Stream, Hunua Road, South Auckland". This is a very small example and the hinge line is not visible but the outline is very close to *P. subtriangulata*, and there is no reason to doubt its relationship (Fig. 8). This is the earliest record of *P. subtriangulata*.

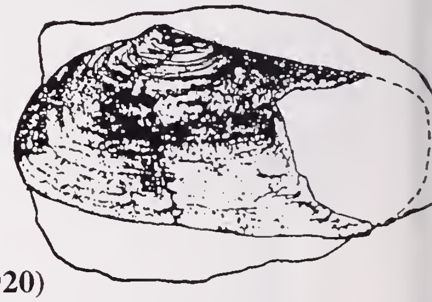


Fig .8, *P. aff. subtriangulata,* Otaian,
Hays Stream, Hunua, Grid reference R12/863566

Paphies (Paphies) crassiformis (Marshall & Murdoch, 1920)

The original description of *Paphies crassiformis* by Marshall & Murdoch[10] states:

> *"Shell of medium size, massive, triangular; beaks almost at posterior end which is abruptly truncated, strongly and acutely angled;"*

R.C.Brazier's drawing in Beu & Maxwell, (1990), of the holotype, does justice to the specimens I have examined in Auckland Museum collection. The hinge is often grossly exaggerated and the shell exceedingly heavy. (Fig. 9)

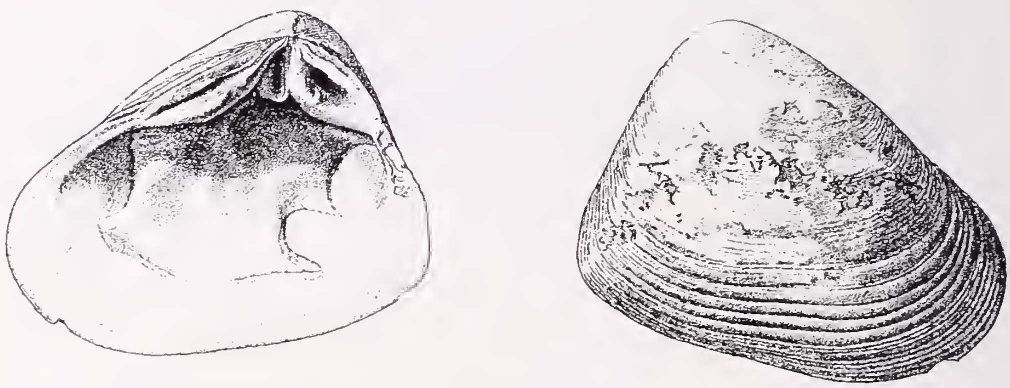


Fig 9. Drawing of *P. crassiformis* from Beu & Maxwell, (1990) x0.5.

I cannot help but see a connection between this species and *P. subtriangulata.* Other species have existed in a grossly heavy form but. *P. crassiformis*, (Nukumaruan, 1.6-2.6 my) remains an enigma. It is more clearly related to *P. subtriangulata* than the other *Paphies* species in New Zealand. These grossly exaggerated forms should be the basis for further study, in particular the paleoenvironment in which they lived. *P. crassiformis* is found with *Lutraria, Zeacuminia* and *Patro,* warm water taxa that live in esturine to semiesturine enclosed bays, and only to the north of New Zealand at present.

Paphies (Paphies) donacina (Spengler, 1793)

Beu & De Rooij Schuiling's extensive investigation of the taxonomy of tuatua has clarified the common confusion of names for the two species. *P. donacina* is the earliest name for the southen species and they list 31 synonyms and other published combinations. The illustration of *P. donacina* (Fig. 11), is drawn from their photographs of the type specimen. The most common synonyms are *P. donacina = quoyii = forsteriana = pliocenica.* Finlay in proposing the name *Amphidesma forsteriana* for this species comments:[11]

> *"This species is so distinct from* subtriangulata *at every growth stage that one cannot understand how the two have ever been confused."*

Powell named this species *quoyi*, and it is known back into the Pleistocene, (Castlecliffian 0.4-1.6 my) where Oliver called it *pliocenica.*

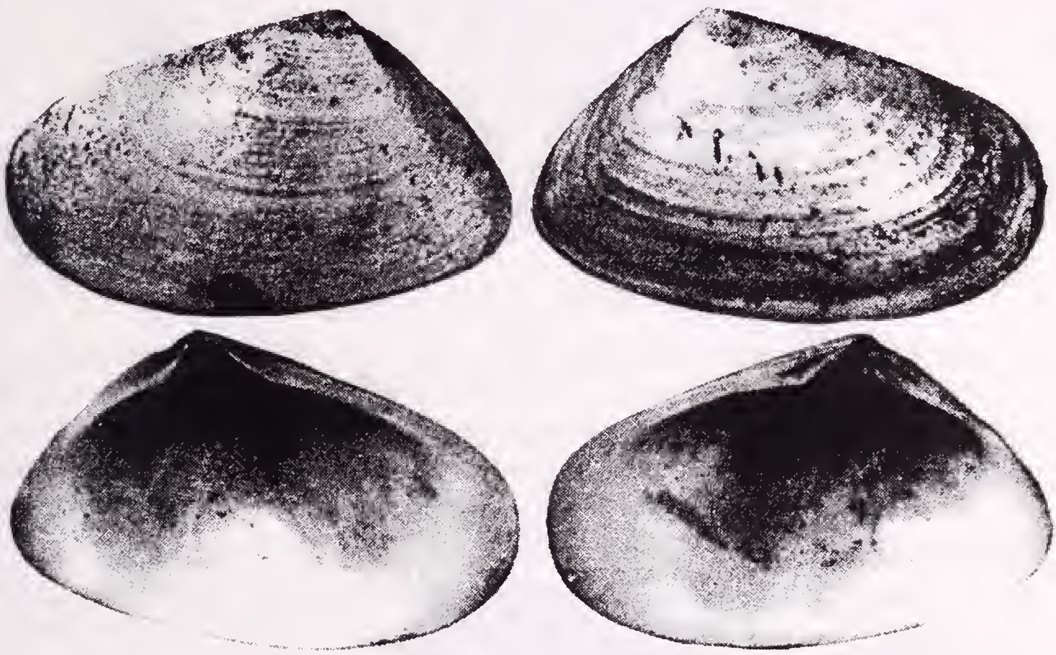


Fig. 11. Type specimen of *Paphies (Paphies) donacina*, holotype of *Mya donacina* Spengler, 1793.

Paphies (Paphies) subtriangulata pliocenica (Oliver 1923a)[12]

Although usually regarded as a synonym of *P. donacina*, doubt still remains about the status of *P. pliocenica*. As Oliver (1923), stated:

"Specimens from the Pliocene beds at Castlecliff are higher than either of the Recent forms, and the angle of the dorsal and posterior sides is intermediate. It is more distinct from the two recent forms than they are from each other and I here propose for it the sub-specific name *pliocenica*."

Oliver considered *pliocenica* a sub-species of *subtriangulata* and the debate has been revisited by three or four authors since. Beu & De Rooij Schuiling (1982) are quite authorative about their synonomy with *P. donacina*, not *subtriangulata* and an examination of many species from Castlecliff would confirm this decision. Yet it is different exactly as Oliver described, and may warrant status as a sub-species of *P. donacina* instead.(Fig. 12)

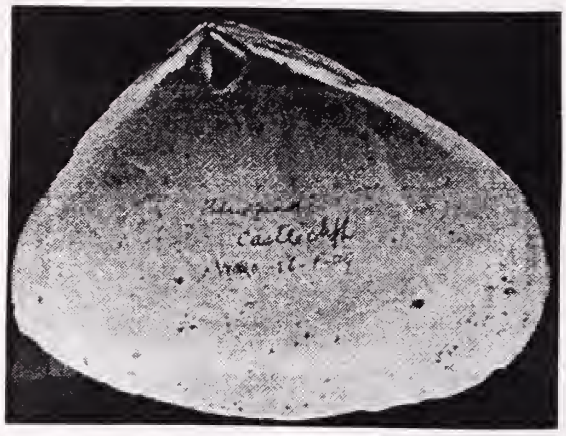


Fig. 12. Oliver's illustration of *P. subtriangulata pliocenica*

There are other *Paphies* from the Kaimatira beds, which deserve mention (Fig. 13). Collected from "Kai Iwi", the specimens in Auckland Museum collection are far more equilateral in shape than the equivalent *P. pliocenica* from Castlecliff. The angle at the unbo is more acute and the umbo is more central, with the anterior and posterior dorsal margins almost equal. Whole beds of these small adult specimens have been found (50mm) and they are light and quite thin.

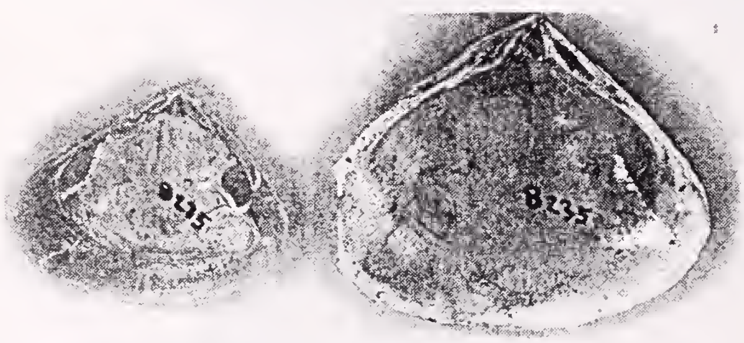


Fig. 13, *Paphies* sp. from Kai Iwi

Paphies (Paphies) cf. donacina (Spengler, 1793) GS 5626

P. A. Maxwell has tentatively assigned this specimen from Birch's Mill Shell Lens, Te Waewae Bay, Southland, to *P. donacina*. The site, grid reference C46/835366, is describrd as early Opoitian (close to 5 my). This would put it close in age to Laws's [13] specimen from Kaawa which it closely resembles. My own investigation of the Kaawa specimen[14] considered that it had affinities with *P. donacina* and *P. porrecta*. It also has close affinities with this specimen. Not only is it similar in age, but the morphologial features, the angle of the resilifer, the posterior muscle scar, the angle at the umbo, the width of the anterior dorsal margin, the external growth lines, and the posterior radial ridge compare very favorably with those of this Te Waewae Bay specimen (Fig. 14.).

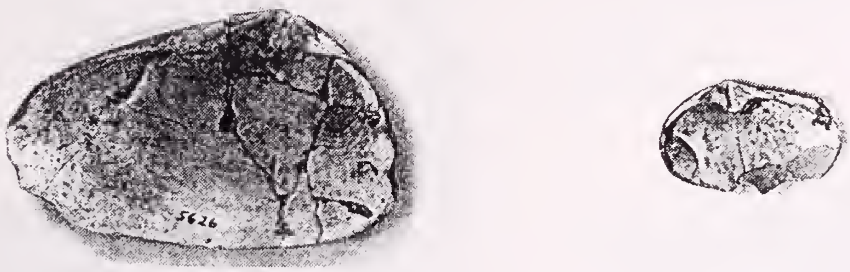


Fig. 14, Te Waewae Bay specimen and Kaawa Creek specimen, actual size.

Paphies sp. Kaawa Creek (Laws, 1940)

This note in Laws's paper recorded his conclusions about this specimen.

> *"A fragmentary left valve, collected by Mr C.A.Fleming, has the hinge and form of [Paphies] Amphidesma. The shell appears to be unicarinate posteriorly, but the surface is rubbed and secondary carination if originally present may have been obliterated. The dentition does not exactly agree with that of any described Neozelanic species."*

Unlike the Te Waewae Bay specimen, the Kaawa specimen is very beachworn and abraided with much of the ventral margin broken away. A careful examination of the features mentioned above would indicate an association with *P. donacina* and *P. porrecta*[15]

Paphies (Paphies) subtriangulata porrecta (Marwick, 1928)

Marwick[16] described a fossil species. His holotype is from Titirangi, (Nukumaruan, 1.6-2.6) Chatham Islands. He described the species as:

> *" Although there is some variation in shape this shell can be readily distinguished from* A. subtriangulatum *by the greatly elongated anterior end and the generally strongly convex posterior end."*

He continues:

> *"Some specimens have almost the same outline as* A. ventricosum *...........but they do not have such a strong ridge on the posterior area and the pallial sinus is shallower."*

The specimen Marwick chose as holotype reflects these similarities to *P. ventricosum* (Fig. 15) whereas the majority of Titirangi specimens in Auckland Museum collection agree more with the first part of his description.

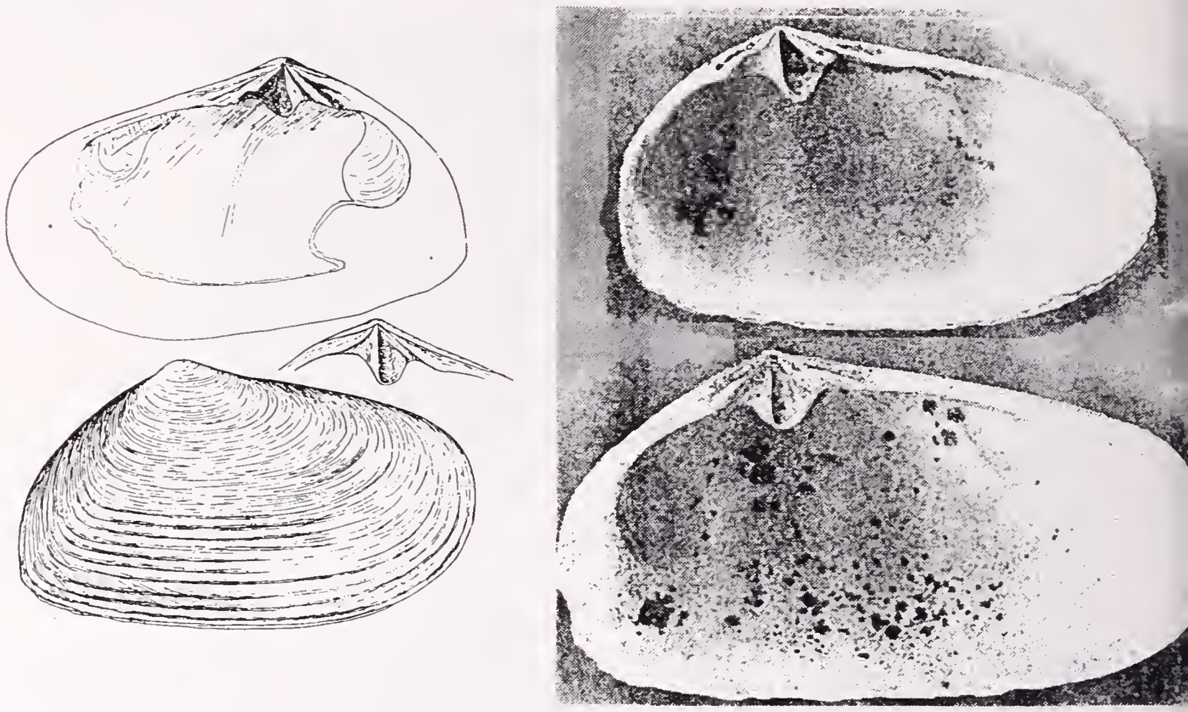


Fig. 15. Marwick's illustration of the holotype and 2 specimens from Auckland Museum collection.

Beu & Maxwell, (1990), commented:

> *" A similar form to* P. porrecta *still lives today on the sand beaches of Petre Bay, Chatham Island, but Smith et al. (1989)*[17] *demonstrated that this is a form of* P. subtriangulata. *Closely similar forms are also abundant in Tangoio limestone near Napier, Hawke's Bay. The relationship of* P. porrecta *to the similar but shorter and higher, more heavily hinged* P. donacina *needs further study."*

Finlay (1928) was confused. He noticed that Oliver (1923) stated that shells from the Chathams "are almost invariably of the broad-angled, thin form," and that "the angle formed by the dorsal and posterior sides varies through several degrees." i.e. *P. donacina.* Finlay continued "...the single valve sent to me is distinctly of the northern type, solid, elongate, with very short, and bicarinate posterior side, and thus referable to *subtriangulata* (Wood)."

Despite Smith et al.'s findings that the Chatham Island species is allied to *P. subtriangulata*, the recent specimens I have examined in the Museum collection, and from two private collections vary so enormously that it is impossible to draw any conclusion from shell morphology alone. I must conclude that it is quite possible that two species lived there in the Nukumaruan, and still do.

Paphies cf. donacina, Colville Channel

These five specimens from the Ponder collection MONZ (M. 21687), clearly resemble *P. donacina* rather than *P. subtriangulata* which is more common in the area today (Fig. 16). Colville Channel is very close to Waitete Bay where sub-fossil *P. subtriangulata* previously mentioned, can be found. Dredged on the "Ikatere" expedition of 1965, these specimens should be studied further.

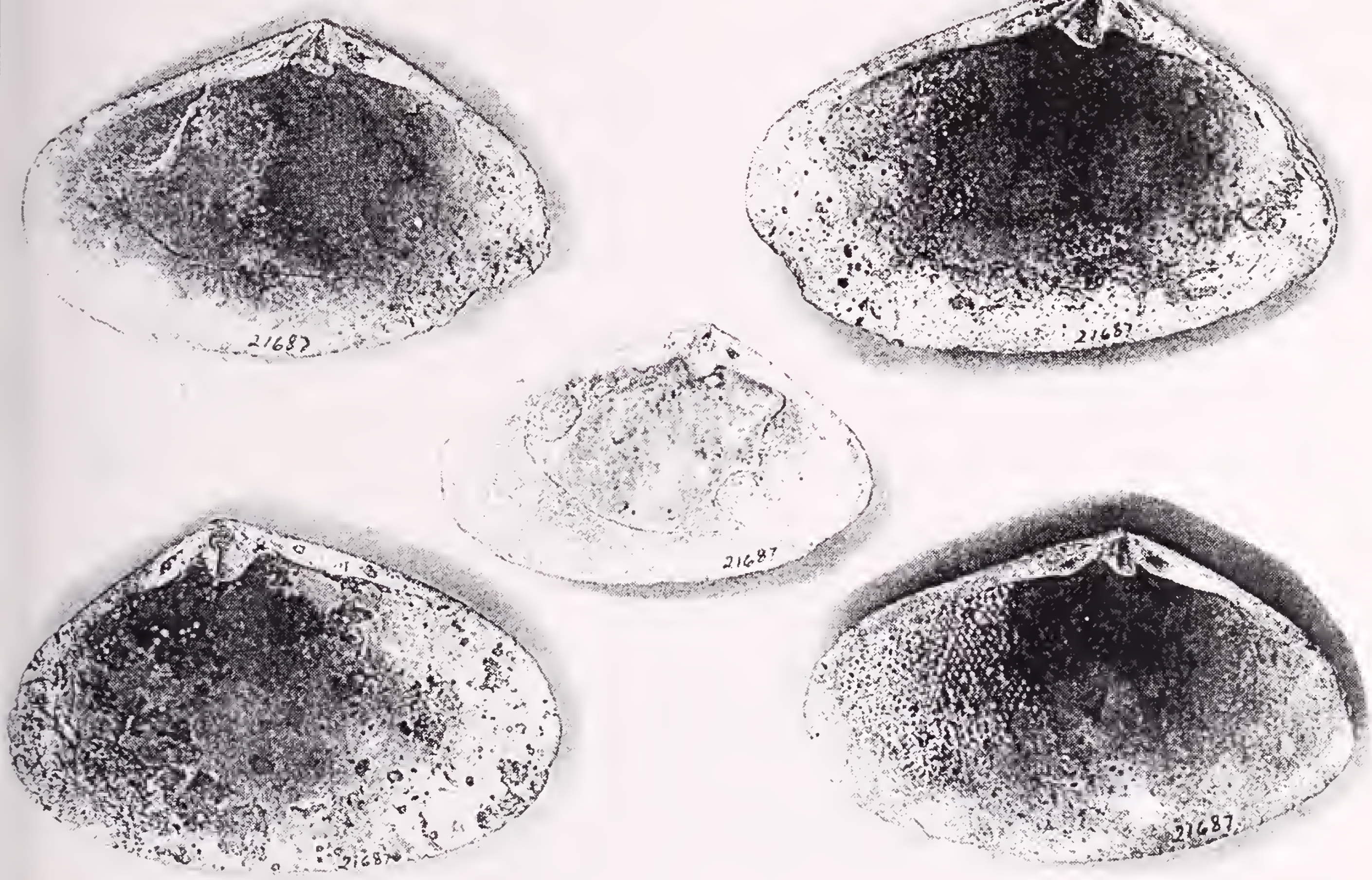


Fig. 16, specimens dredged from the Colville Channel

DISCUSSION:

The scarcity of *Paphies* species in the fossil record has often been taken as an indication that they are recent arrivals. The environment in which the Tuatua and Toheroa live is poorly represented in the fossil record. The specimens from Hayes Stream,

Waiheke, and TeWaewae Bay indicate that the species were present back to the Early Miocene, as was the Pipi.

The presence of massive examples such as *P. crassiformis* in the Nukumaruan, indicates that a study of the paleoecology of other massive species would be useful.

The *P. subtriangulata* found on Mission Bay and coming out of the Pakiri dredgings have been found in association with *Anadara trapezia*, a species which has not lived in New Zealand for 125,000 years (A. Beu, pers. comm.) However, as these fossil Anadara are to be found in many locations around New Zealand today, it is difficult to claim that they help date the Pakiri specimens as the Anadara could have been reworked and redeposited. Only dating by 14C method will give us the age.

Acknowledgements: Sincere thanks are due to NMNZ and IGNS for the loan of specimens. To Bruce Hayward, Mike Eagle and Alan Beu for their patient response to persistent questioning. To Hugh Grenfell for tuition in Photoshop and to members of the Auckland and Wellington Shell clubs for providing me with endless specimens.

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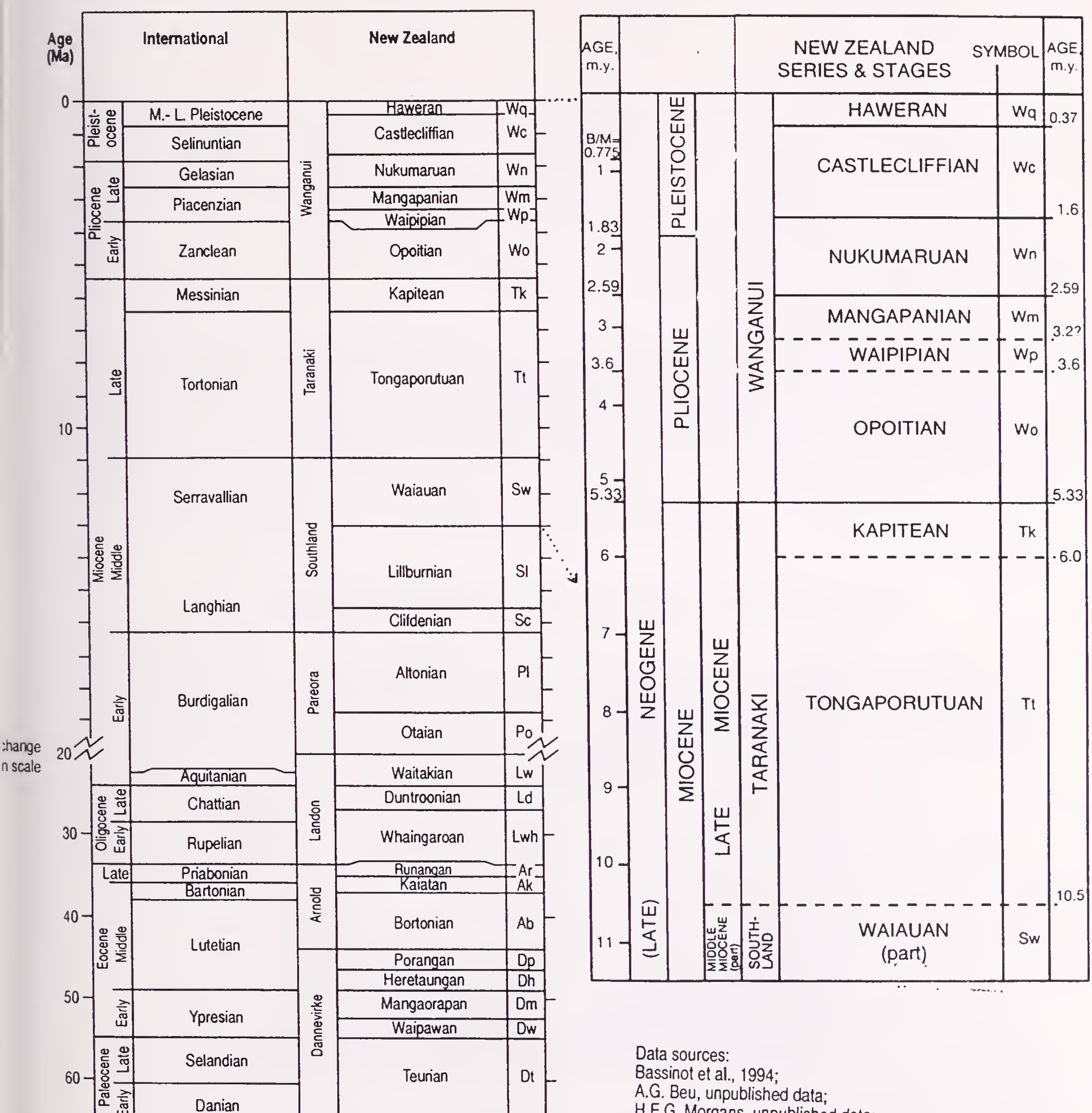
Appendix 1.

New Zealand Timescale Project: interim Cenozoic timescale



Data sources:
Bassinot et al., 1994;
A.G. Beu, unpublished data;
H.E.G. Morgans, unpublished data;
Rio et al., 1994;
G.H. Scott, unpublished data.

Compiled by J.S. Crampton,
December 1994.

Rissoina manawatawhia Powell, 1937 (Rissoidae: Rissoininae): extension of range and egg capsule.

by Margaret S. Morley

The type locality for this species is off the Three Kings Islands in 92 m. It has also been recorded at the same locality in 260 m, but has not previously been recorded from elsewhere.

In 1970, specimens were dredged in a depth of 100 m off North Cape (author's collection).

In November 1995, the Auckland Museum Marine staff went on a field trip to the Bay of Islands to continue a dredging survey. While sorting and identifying molluscs in sand from a depth of 21 m, taken 300 m northwest of Moturua Island (Fig. 1), I noticed two live specimens of *Rissoina manawatawhia.* Each specimen had an egg capsule attached to its shell (Fig. 2). The capsule was soft and filled with fluid. Under the microscope the single embryonic shell could be seen moving inside. This was reminiscent of the egg capsules on the ectoparasitic molluscs *Chemnitzia bucknilli* (Morley 1991), (Spencer and Willan 1995).

Powell (1979) describes *Rissoina manawatawhia* as highly polished and smooth, apart from a few very faint spiral striations, and weak growth lines. Colour pale pink, with an indistinct, subperipheral spiral white zone. The Auckland Museum specimens (AK 100834) fit this description although the spiral striations are distinct over most of the postnuclear shell.

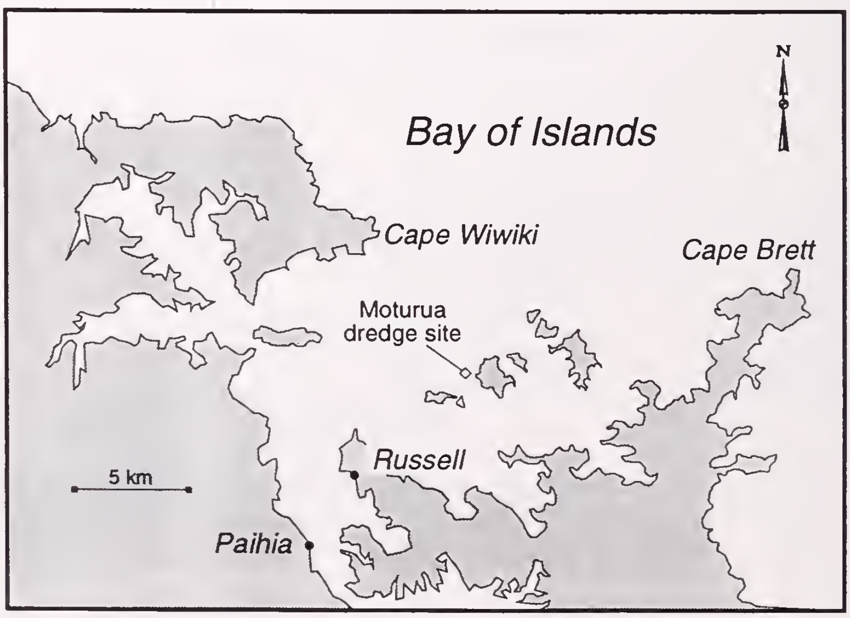
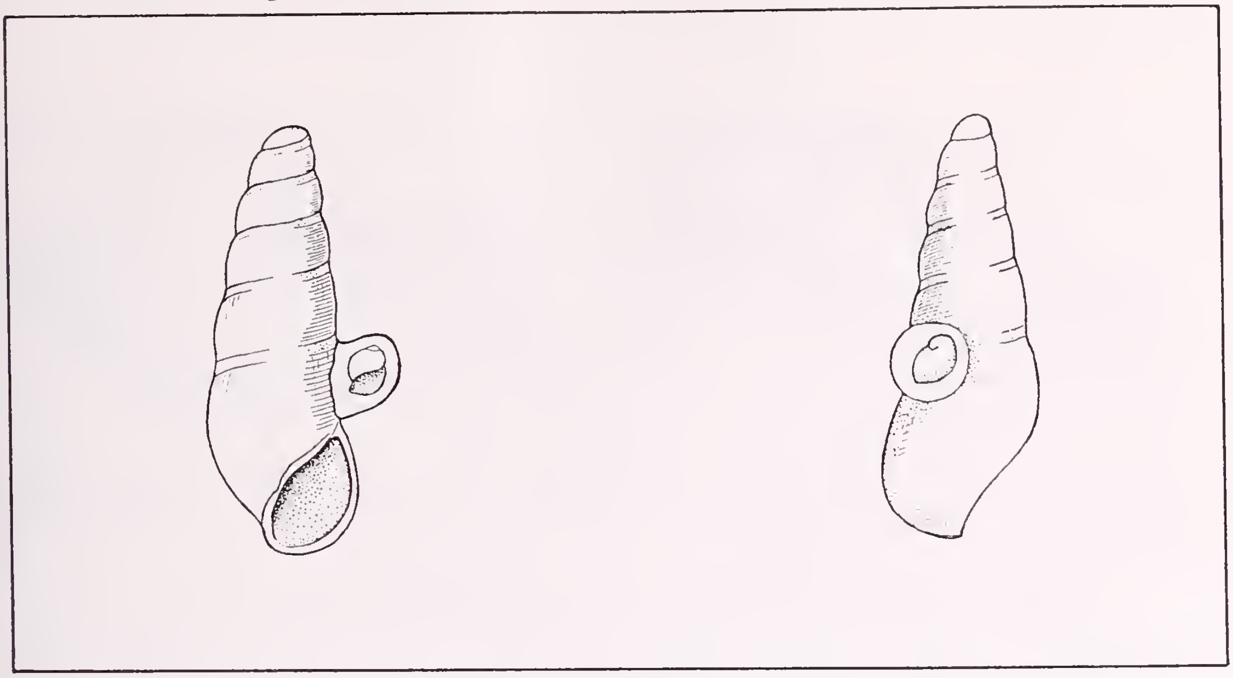


Fig. 1 Moturua dredge site, Bay of Islands.

Fig. 2 Egg capsule on *Rissoina manawatawhia* Powell, 1937.
Shell size: Height 4.4 mm, width 1.6 mm.



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POIRIERIA TWENTY YEARS AGO from Nancy Smith

The late Norman Douglas described finding his first live *Cyclomactra tristis* from the soft black ooze in the extreme southern reaches of the Manakau harbour.A lovely illustration shows the extended syphon which can be 6 times the length of the shell. N.W.G. offered notes on the genus Thoristella with line drawings of the four species and six subspecies. *T. carmesina* Webster and *T. chathamensis benthicola* Finlay have since disappeared from the books. Where have they gone?

Overseas news was popular. Mr L. Price was reported to have collected limpets in American Samoa; fossils of such treasures as *Conus gloriamaris, C.kimioi* and *Cypraea porteri* were being found in exellent condition in the New Hebrides; Ross Wallace had holidayed in the Seychelles where they were disappointed to find the best reefs closed because of overshelling. However they saw many cones and cowries and beach collecting was allowed; The Seelyes had a week in Rarotonga and listed their finds which included lots of cones and cowries; and the Gardners collected in Queensland from Cairns northward.

At home "The Invasion" of exotic molluscs was in the news then just as it is today. *Theora lubrica* had established itself in Golden Bay. *Nassarius spiratus* after having increased greatly in numbers since first sighted in 1952, had now declined or dispersed whereas *Hydatina physis* was being found in good numbers for the first time since its appearance in 1924. Only two specimens of *Hydatina albocincta* had been recorded. *Crassostrea gigas* was being recognised as unstoppable just 5 years after its debut, while *Limaria orientalis* and *Morula chaidea* were declining in recorded numbers.

Zelippistes benhami (Suter, 1902):(Gastropoda: Capulidae)

by Margaret S. Morley

The type locality of this uncommon mollusc is Cape Maria van Diemen. It has also been found in 260 m, off the Three Kings Islands; the Hauraki Gulf; Northland's east coast and in 37 m off Motiti Island, in the Bay of Plenty (Fig. 1).

This species is commensal with a tubeworm (*Galeolaria hystrix*). The mollusc has been observed living on the underside of a large stone, subtidally at Goat Island, Leigh. It was attached to the tubeworm. Its outer lip was positioned next to the margin of the tubeworm's aperture, where it was presumably feeding on left-overs (R.C. Willan, pers. comm.). This appears to be confirmed by the fact that the organs of the mantle cavity are highly modified for filtering (Dell & Ponder 1964).

A mature *Zelippistes benhami* was found during an Auckland Museum field trip in November 1995 (AK 101166) (Fig. 2).It was dredged in 27 m, 1 km ESE of Moturoa Island in the Bay of Islands. Although the mollusc was not taken alive, it was in very fresh condition. It is yellowish white.

In 1990, Martin Walker kindly gave me some shells from his late father's collection. Among these shells was a growth series of *Zelippistes benhami* from shell sand collected by Jock Walker at Spirits Bay in 1964 (Fig. 3).

The protoconch has two and a half smooth whorls. The sculpture of the first whorls of the teleoconch consists of eight spiral cords crossed by irregular, but distinct axials. The juvenile shell has an umbilicus and the aperture is D-shaped with a well developed anterior canal. In its adult form, the anterior canal disappears, the aperture becomes detached from the body-whorl which expands greatly to the right (Dell & Ponder 1964). The large flanged aperture is extremely variable in shape, no two specimens being the same (Gardner 1968).

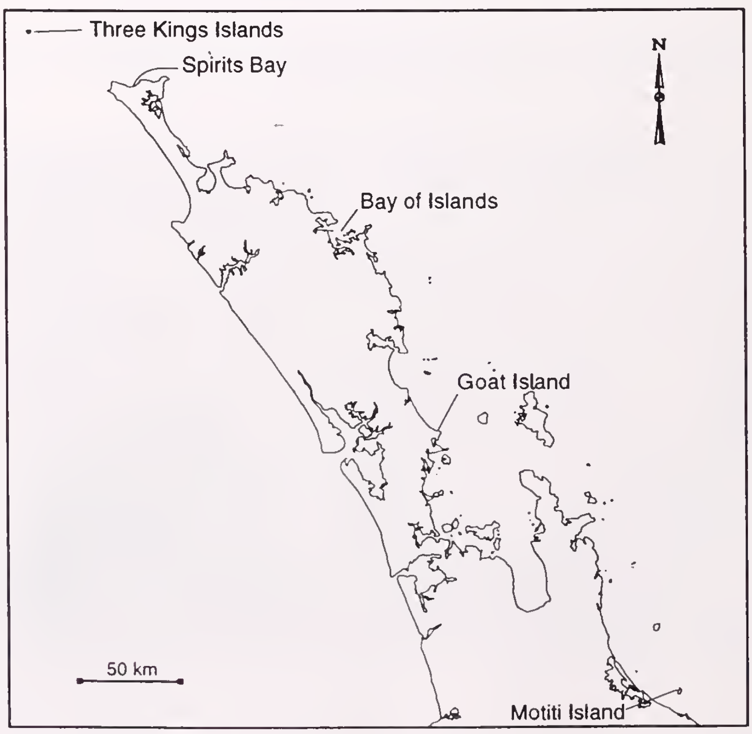


Fig. 1 Geographic range of *Zelippistes benhami*

Fig. 2 *Zelippistes benhami* (Suter, 1902).
Height 6.5 mm, width 11.08 mm.

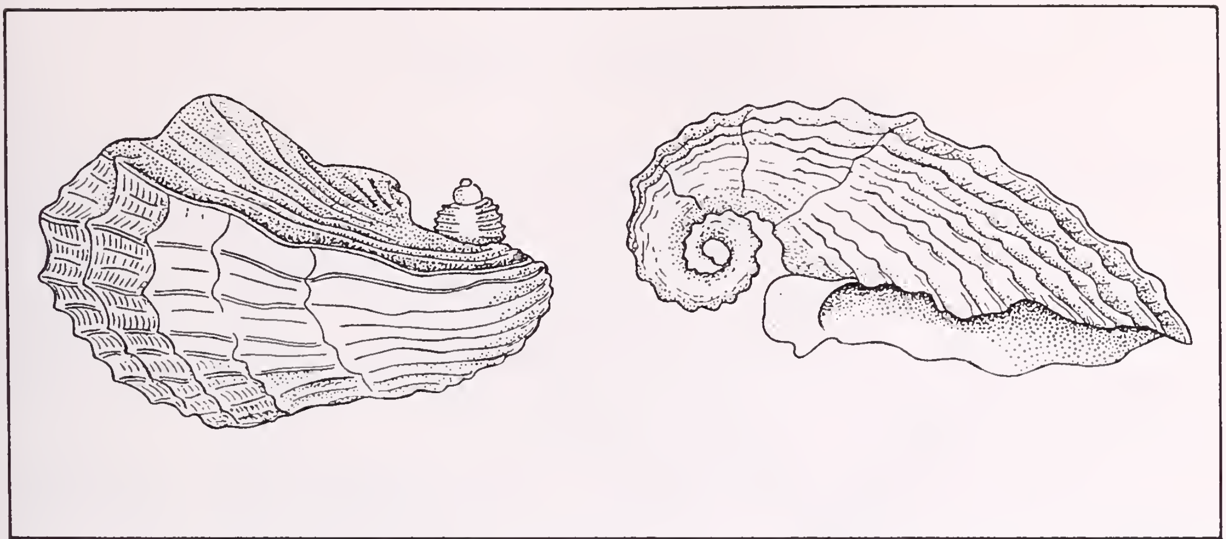
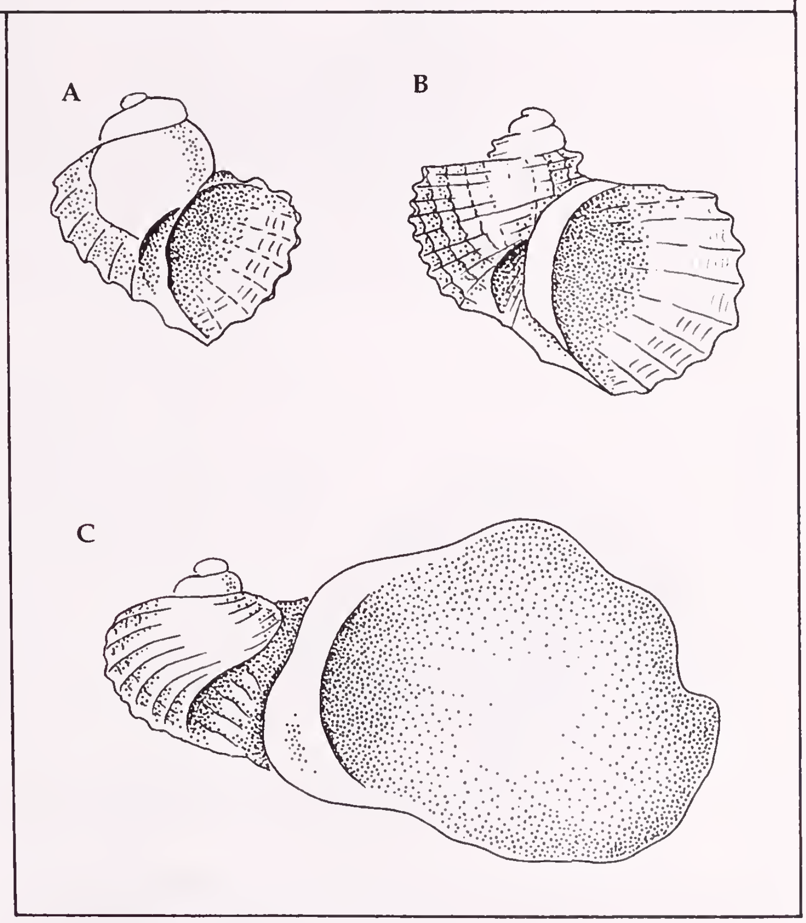


Fig. 3 Growth series

Zelippistes benhami.

A. Height 1.3 mm, width 1.2 mm.
B. Height 3.3 mm, width 4.9 mm.
C. Height 4.3 mm, width 8.4 mm.



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ACKNOWLEDGEMENTS

I thank Dr Richard Willan for his critical appraisal of the text.

Psilaxis radiatus (Röding, 1789) (Gastropoda: Architectonicidae)

by Margaret S. Morley

This introduced mollusc was previously known as *Philippia radiata* (Spencer & Willan 1995).

The geographic range for this species is the Indo-Pacific, from South Africa and the Red Sea to the Hawaiian Islands and the Marquesas. In New Zealand it is a rare find on the east coast of Northland. The first specimens were found in shell sand at Takou Bay near Whangaroa, by Mr C.H. Robinson in 1936 (Powell 1938). In October 1994, during an Auckland Museum field trip to the Bay of Islands, I found a specimen of *Psilaxis radiata* (Fig. 1) washed up on the east side of Okahu Island (Fig. 2). Although the aperture and protoconch were damaged it was still an exiting find.

The Bay of Islands shell (AK 88875) is white with orange blotches and spiral lines, the umbilical margin is white. The umbilicus is deep and wide with a heavily crenulated border. It differs from *Philippia lutea* in having only one peripheral spiral keel.

It is interesting to note that some species of the family Architectonicidae have been found with egg masses laid in the umbilical cavity e.g. *Heliacus cylindricus* (Robertson unpublished). There is also information that young postlarval *Psilaxis oxytropis* live in the umbilicus of adult shells. A specimen of *P. radiata* was collected at Rarotonga, Cook Islands with an egg mass in the umbilicus. However the eggs were small and had too little yolk for direct development. Therefore the veligers of *P. radiata* and *P. oxytropis* cannot be brooded and must have a long pelagic stage, despite the unusual placement of the eggs and larvae (Robertson 1970).

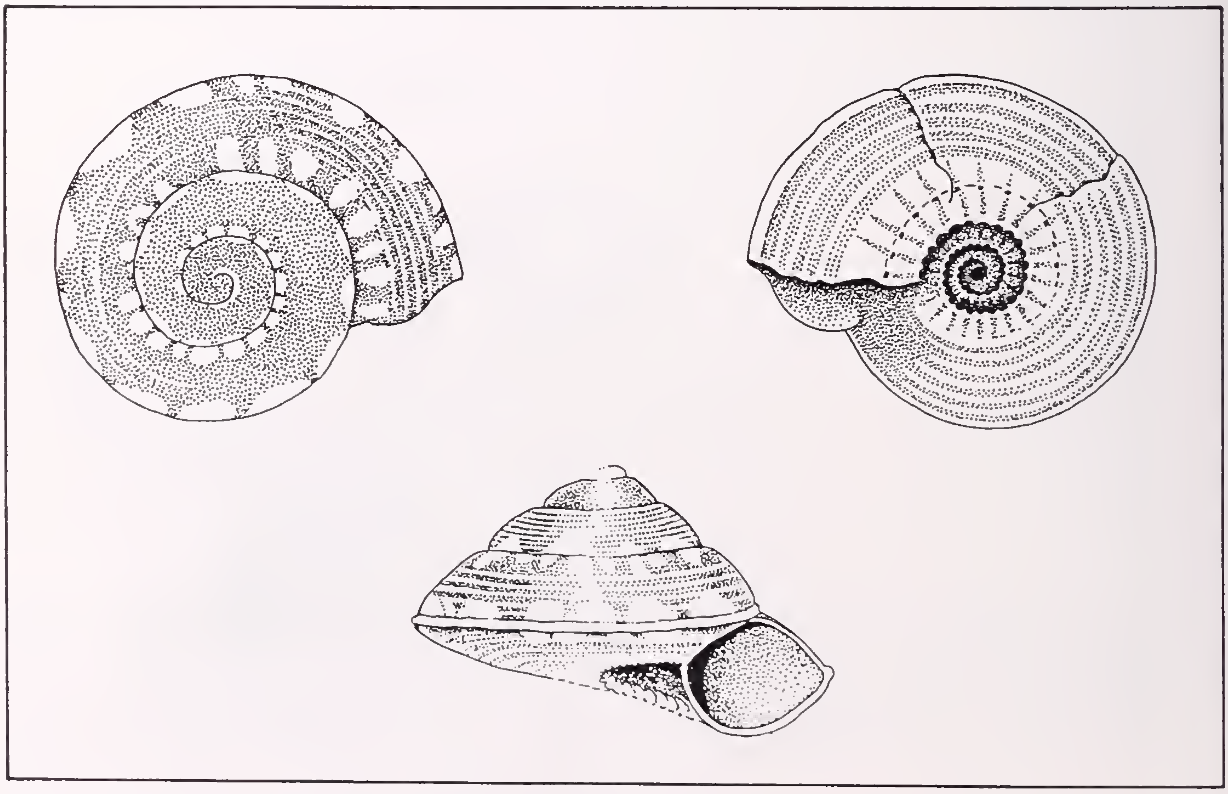
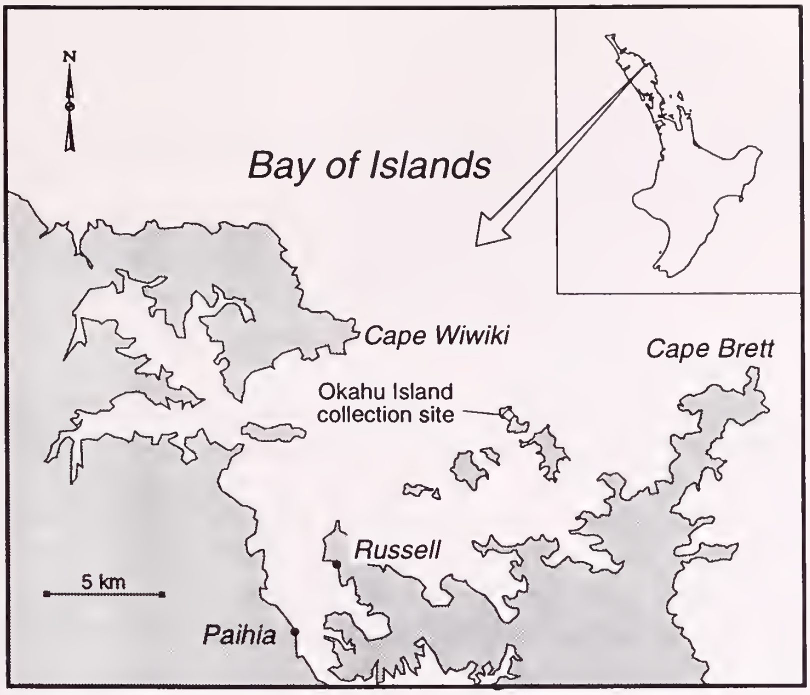


Fig. 1 *Psilaxis radiatus* (Röding, 1789) from the Bay of Islands.
Height 9.7 mm, width 13.6 mm.

Fig. 2 Bay of Islands



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C.I.T.E.S. and the overseas traveller!

Further to our article in **Poirieria Vol. 16, No. 5, November 1993,** on the Convention on International Trade in Endangered Species (C.I.T.E.S.) of Wild Flora and Fauna, the following mollusc needs to be added.

Strombus gigas Linnaeus, 1758

Commonly known as the Queen Conch, it is found in Florida, Bermuda and the West Indies and is used locally for food and, until recently, in the tourist trade. It can no longer be brought into New Zealand either commercially or privately.

Plocamophorus imperialis (Angas, 1864) (Nudibranchia: Polyceridae: Triophinae)

by Margaret S. Morley

In March 1996, the marine staff of the Auckland Museum visited the Parengarenga Harbour to continue a dredging survey. On the third day, the boats landed at Dysons Beach on the northern side of the harbour towards the entrance (Fig. 1). There was heavy rain and a driving wind - not pleasant conditions for eating lunch! We found some shelter from the wind against the cliff, but the large drops of rain from the pohutukawa trees made the sandwiches sodden. There was some reluctance to start collecting in the windier conditions along the low tidal sand.

All discomfort was miraculously forgotten when Bruce Hayward found an unusual nudibranch, *Plocamophorus imperialis* (Fig. 2). It was crawling exposed at low tide, amongst algae. Its length was 70 mm. The animal's body was bright red with small dark spots and two longitudinal, cream stripes. The rhinophores were bright orange with bulbous, purple tips. The body had three pairs of tufted appendages. Posterior to the gills were two globes. These emit a brief flash of light if the nudibranch is prodded at night (R.C. Willan, pers. comm.). The oral veil had small, compound papillae, about twelve around the margin. The large brown branchial plume was attached to the body on a pedestal. The tail was quite thick and triangular in section. When the animal was released into the water, the tail turned sideways and there was a strong swimming action with undulations of the whole body.

Jenny Riley found two more specimens on a sandbank off Dysons Beach at low tide, near eel grass *(Zostera)*. The larger specimen measured 100 mm and was much paler, being pale pinkish buff on the body with fine brown spots. The second specimen was 55 mm long and was dark red. It was retained for the Auckland Museum collection (AK 104471).

A fourth specimen was found by Glenys Stace while she was snorkelling at Ngatehe Point, 500 m north of Dysons Beach. This specimen was seen just below low tide clinging to a strand of brown alga *(Carpophyllum* sp.) It was laying a coil of orange spawn mass on a stone (Fig. 3). The animal measured 60 mm.

The geographic range of *Plocamophorus imperialis* is throughout the tropical, western Pacific Ocean, extending as far south as Tasmania and northern New Zealand, in depths of 0 to 15 m (Willan and Coleman 1984). It was first seen in New Zealand in the Parengarenga Harbour about 30 years ago (M.C. Miller, pers. comm.).

There are records of adults in the Parengarenga Harbour from April 1973 and April 1976. Also two juveniles were found at the Three Kings Islands in January 1984. It appears that the Parengarenga Harbour is the stronghold of *P. imperialis* in New Zealand, where it probably lives and breeds permanently (R.C. Willan, pers. comm.).

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ACKNOWLEDGEMENTS

The manuscript has benefitted from the critical appraisal of Dr Richard Willan.

Thanks to Hugh Grenfell for the maps relating to these articles.

Fig. 1 Parengarenga Harbour.

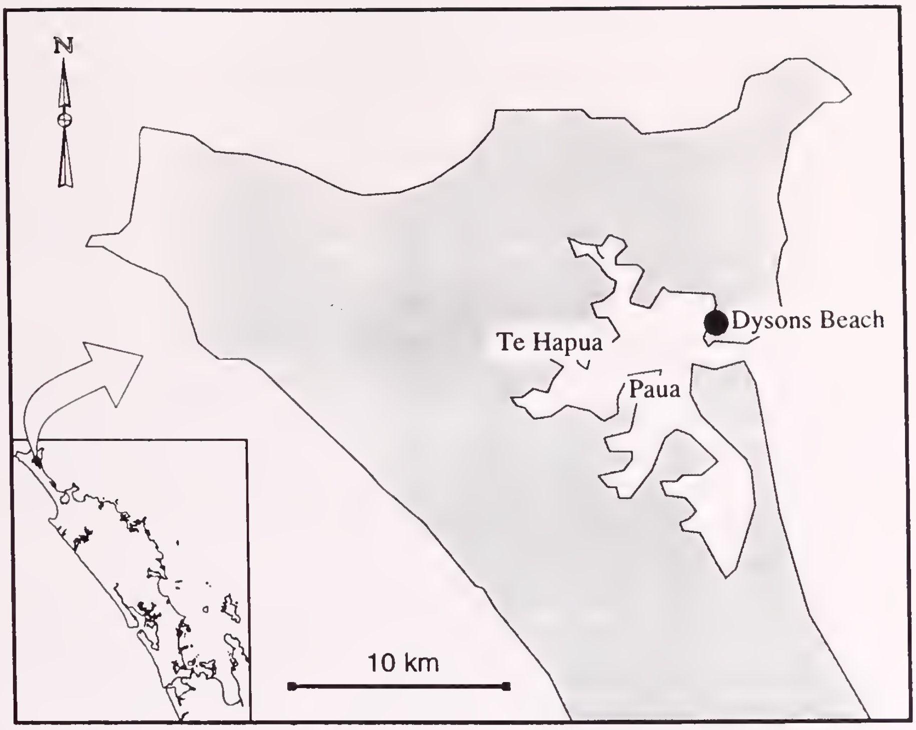


Fig. 2. *Plocamophorus imperialis* (Angas, 1864).

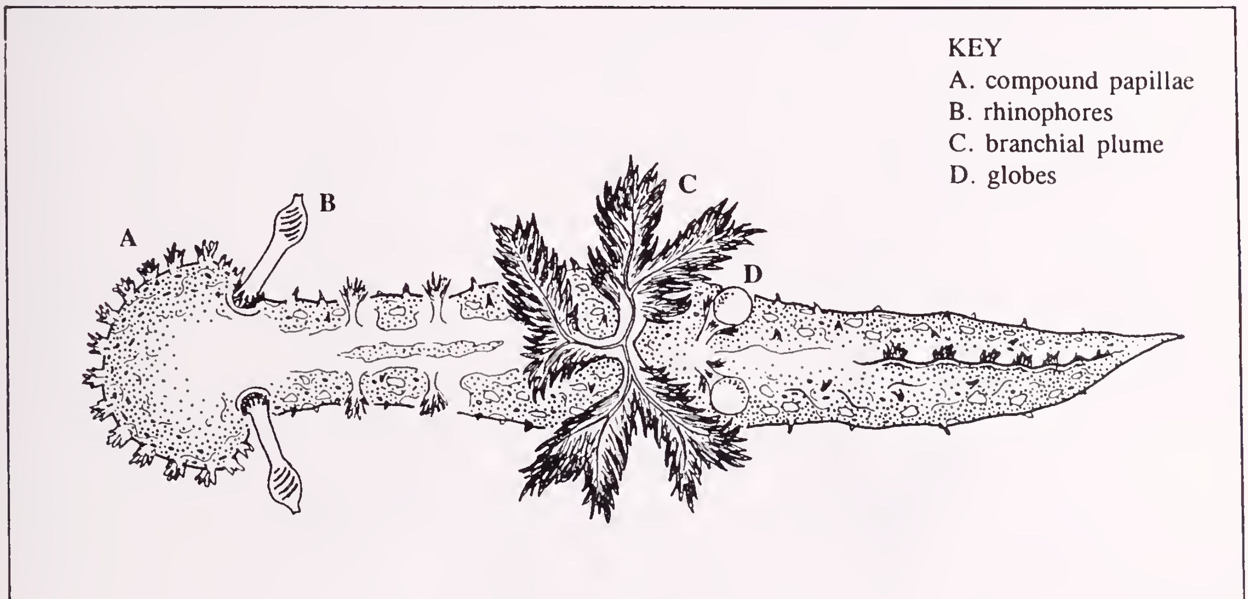
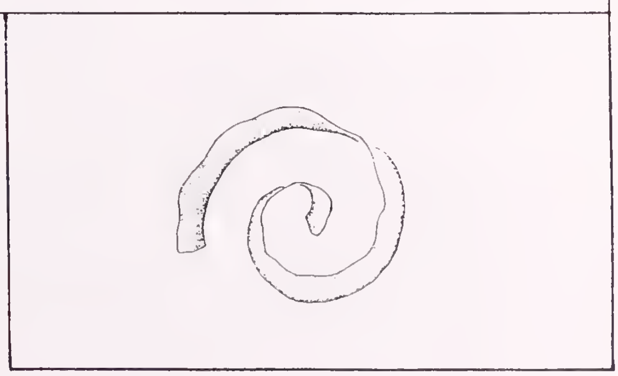


Fig. 3. Spawn mass of *Plocamophorus imperialis*, drawn actual size



ACIRSA SUBCARINATA (Murdoch & Suter,1906)

by Nancy Smith

Acirsa subcarinata was first described as *Diala subcarinata* Murdoch & Suter,1906 then reclassed as *Eusetia* by Powell, 1962, finally moved to *Acirsa* Ponder, 1967, where Powell left it but commented (1979) "no living examples of this rare problematic species have been found, so its true systematic identity remains in doubt."

I have searched through heaps of grunge without finding one, dead or alive. Requests in our Auckland Museum Conchology Section newsletter to buy, beg, borrow or just sight specimens of this shell brought not one response. Does nobody ever find it or do they just not identify it as an Epitonium?

I have examined the 2 specimens (AK19583, AK17935) in the Auckland Institute and Museum and doubt that it is an Epitoniid. The shells are very tiny (2.9mm) and rather worn looking and my ignorance is enormous and only slightly frayed round the edges, but to me it does not look like an Epitoniid. (See Fig. 1.) This illustration appeared in the The Atlas of Plates, companion volume to the Manual of New Zealand Mollusca" Henry Suter 1913. Suter's original description is virtually identical to the one in the Manual.

I think it looks like an Aclidid, (see Fig.2.) The Aclididae are described by Powell 1979 as having an affinity with the Epitoniidae in their loosely wound shell and their radula teeth. But, he says, the embryology is more like Pyramidellidae. Beu and Maxwell 1990 ascribe *Epitonium (Acirsa) ornatum*, fossil, to the genus *Batillona* Finlay,1927 - This brings us back to the original name, *Diala* and *Batillona* both being Cerithids, but the illustration of *E. ornatum* clearly shows the cerithid affinity.

I firmly believe that the examination of the animal should be of prime importance in the naming and particularly in the renaming of molluscs, but when only the shell is known what can you do? Just wait for the live mollusc to turn up I guess!

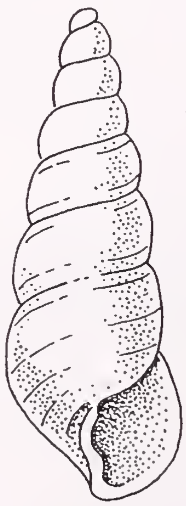


Fig 1. *Acirsa subcarinata*, after Suter 1913, Height: 2.9mm

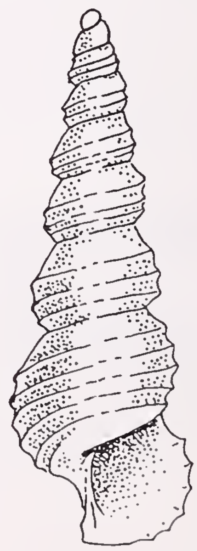


Fig 2. *Aclis pseudopareora* Height: 3.2mm

Acknowledgement: Thanks to M.S.Morley for the illustrations.

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Beu,A.G. & Maxwell, P.A. 1990 Cenozoic Mollusca of New Zealand, p.140
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Ponder, W.F. 1967, Classification of Rissoidae and Orbitesstella with New Taxa, Transactions of the Royal Society Zoology 9(17):193-224
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A SURPRISE AT GOVERNMENT HOUSE, AUCKLAND

Jim Goulstone

The week of last year's Ellerslie flower show also saw the grounds of Government House open for two days. Gladys & I gave the former a miss but set out on a wet Friday with our umbrellas to see what grandeur the latter had to offer. An information brochure at the guardhouse with a useful map, plus lots of arrows on stakes, plus lots of volunteer guide ladies with E.R. armbands nonetheless failed to inform us of the greatest treasure the garden had to offer, a pristine rock outcrop with some original native growth mostly karaka and mahoe.

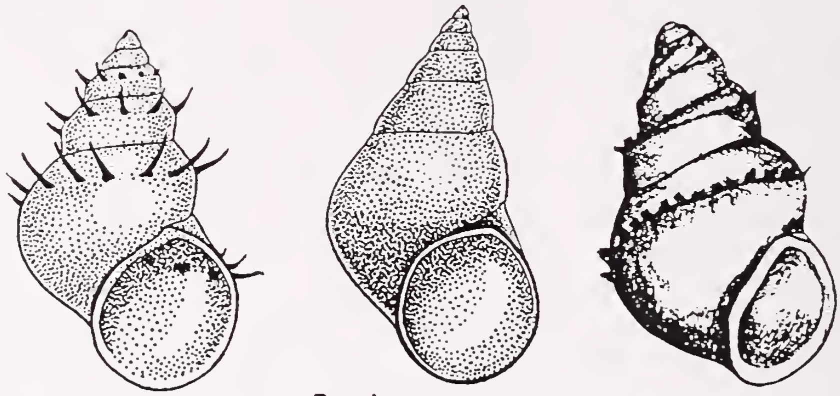
Of course you've guessed the rocks were full of native snails and we hadn't taken a bag or even a tube -- so while Glad strode ahead pretending she had nothing to do with me I guiltily collapsed the umbrella and filled it with leaf litter. How foolish I felt inspecting the rest of the gardens in the rain using a bulging umbrella only as a walking stick.

Here is a list of snails I extracted at home from the umbrella. Charopa coma (Gray), Charopa parva (Suter), Cochlicopa lubrica (Müller), Delos coresia (Gray), Flammulina perdita (Hutton), Geminoropa cf. cookiana (Dell), Lauria cylindracea (da Costa), Liarea egea (Gray), Mocella eta (Pfeiffer), Oxychilus cellarius (Müller), Paralaoma caputspinulae (Reeve), Paralaoma lateumbilicata (Suter), Phenacharopa pseudanguicula (Iredale), Phenacohelix giveni Cumber, Phenacohelix pilula (Reeve), Phenacohelix ponsonbyi (Suter), Phrixgnathus erigone (Gray),Phrixgnathus cf. ariel (Hutton), Phrixgnathus conella (Pfeiffer), Phrixgnathus moellendorffi (Suter), Punctid n. sp. 29, Tornatellides subperforata (Suter), Tornatellinops novoseelandica (Pfeiffer), Vitrea crystallina (Müller).

A strange omission from this substantial list is Helix aspersa Müller so I can only compliment the gardeners who have evidently not spared the "Blitzem".

P.S. One or two of these species came to light the next day after I sent along another collector who I wont incriminate!

Further to the article on *Potamopyrgus antipodum* in a recent Poirieria, readers may be interested in this article appearing recently in a South Island newspaper.

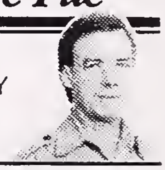


Still water form, with large spines. Running water form, without spines. Intermediate form.

Common native New Zealand freshwater snail, *Potamopyrgus antipodum*, which was this month discovered in the United States.

NZ snail set to colonise world

Nature File



ANTHONY HARRIS

Otago Museum

An urgent e-mail message was received from the United States last Tuesday. A United States fish-ecology department requested immediate information on New Zealand's most typical native freshwater snail. *Potamopyrgus antipodum.*

This freshwater snail has been found in the Madison River drainage in Yellowstone National Park and the Americans are concerned about its spread throughout Yellowstone's headwaters.

P. antipodum is very common in both still and running water throughout New Zealand. It is 3 to 12mm high and though exceptionally variable, usually resembles one or other of the three accompanying illustrations.

Genus *Potamopyrgus* has nine New Zealand species, and several others in South and East Australia. Although it occurs naturally only in New Zealand and Australia, a species *P. jenkinsi* is now common in both England and continental Europe. *P. jenkinsi* is thought to have been introduced there late last century from either Australia or New Zealand and is still extending its range in Europe.

Potamopyrgus antipodum, the species discovered in the US this month. occurs in New Zealand on lake bottoms and rivers, as well as in tiny seepages. It even occurs in brackish water in estuaries. Until this month it was thought to occur only in New Zealand.

In still water. it often develops large spines around its whorls, while in running water it frequently lacks spines. The two extreme forms look so different that until recently they were thought to be separate species and each had its own scientific name. A great number of intermediate forms exist. and the overall shape ranges from broad to narrow. Its colouring is also variable, ranging from pale yellow to almost black. The life history. too, is variable.

This snail gives birth to live young. Embryos develop in a brood pouch within the shell. and small snails with fully formed shells are released all year round. Most snails are females whose eggs develop without fertilisation. Sexually fully functional males nevertheless occur in some populations.

The snail is an algal and detritus grazer and itself forms an important food of fish.

Because *P. antipodum* has appeared in a national park in the US, where native American species are preserved in a natural condition, the park authorities will almost certainly try to eradicate it. However, that might not be possible, without destroying other more delicate freshwater life. This snail is adaptable and hardy and it will be difficult for the Americans to control its spread.

An Australian and New Zealand *Potamopyrgus* species has clearly demonstrated its ability to colonise freshwater habitats in Europe. A vigorous, adaptable species like *P. antipodum* could likewise colonise North American streams, probably to the detriment of American native freshwater snails.

Distribution of Toheroa (*Paphies ventricosa)*

by Glenys Stace

"West Coast beaches", is the answer one expects when asking where toheroa live.

In the past it was the West Coast beaches that were renown for their populations of this gastronomic delicacy. Ninety Mile, Dargaville and Muriwai in the north, Hoteo, Waikenae and Himitangi north of Wellington, Oreti and TeWaewae Bay in the South Island. Now scarce at these North Island locations, toheroa are still plentiful on Oreti and common on Bluecliffs beach TeWaewae Bay. So plentiful in fact that another open day was to be held on Oreti in August this year until a huge washup left tens of thousands dead on the beach.

Researching early papers and MAF reports, it is occasionally mentioned that a small colony of toheroa lived on Tokerau Beach, on the east coast of Northland's Karikari Peninsula. R. M. Cassie [i](1955) states "Local resident reported that toheroa had been present for short periods in 1907, 1925, 1932 and 1937". Rapson[ii](1951) mentions "They have been reported on the east coast, at Tokerau beach and Te Arai. In these last two places they were probably planted".Greenway[iii](1974), who was in charge of the beach surveys for many years says "The small population on Tokerau beach appears to have remained fairly static at about 1/3 million toheroa.

In the course of my recent research on toheroa I tend to pick up toheroa shells wherever I find them. To be truthful, they leap up into my hand! In the spring of 1995, I visited Uretiti beach, between Waipu and Marsden Point, two or three times on my travels up north. Each time I found freshly dead conjoined toheroa, the largest 9.5 cm in length. The majority were small for the species, about the average size of a tuatua, a species plentiful on this beach.

I began to take more notice. I collected specimens from Rarawa, Orewa, Long Bay and began to find them regularly at Omaha. On a trip to the East Cape in January I found them at Opotiki and in June, at Waihi, Mt Maunganui and Papamoa. One specimen from Waihi was still alive and is now in the Auckland Museum collection.

My next step was to look at where fresh, conjoined specimens had been found, indicating that they were living on those beaches. The locations from my own and the Museum's collections are tabulated below.

334	Ninety Mile	N04 262848	Waipapakauri	R. Rule	
337	Ninety Mile, The Bluff	N03 012240		Stace & Morley	23-Mar-96
381	Ninety Mile, Ahipara	N04 240702		M.S.Morley	26-Nov-94
386	Aramoana	J44 320893		F. Thompson	01-Jan-84
376	Bayley's Beach	P07 775832	Dargaville	N. Smith	29-Jan-86
98	Coopers Bch	O04 580900		G. Stace	23-Mar-96
24	Glinks Gully	P08 881680	near Alan Webb's bach	Stace & Webb	19-Nov-90
25	Glinks Gully	P08 978530	GG to Round Hill	G. Stace	01-Dec-91
380	Herekino, Sand Bay	N05 260560	near entrance	M.S.Morley	25-Nov-94
385	Himitangi	S24 991902		M. Eagle	01-Sep-93
67	Kariotahi Bch.	R12 570342	W. Coast, Waiuku	G. Stace	14-May-92
144	Kawerua	O06 501198	Waipoua	B. Hayward et al	28-Jun-93

375 Kuaotuna	T10 535938		N. Smith	
19 Long Bay	R10 669005	North end	G. Stace	01-Dec-90
221 Mimiwhangata Bch.	Q06 395392	Mimiwhangata Reserve	G. Stace	18-Apr-94
71 Mt Maunganui	U14 910916	Ocean Beach	N. Smith	01-Mar-85
309 Muriwai	Q09 161212	5km N of 26mile	Kondo & Stace	21-Jan-96
32 Muriwai	Q11 373857	Surf club	G. Stace	21-Jan-92
15 Muriwai	Q11 368870	5k N. of Muriwai	G. Stace	01-Oct-90
6 Muriwai	Q10 298002	1k N. Rimmers Rd	G. Stace	02-Dec-90
382 Muriwai, toheroa beds	Q10 200155	100m n. of last beach entrance	G. Stace & S. Hooker	10-Jan-91
193 Ngunguru, Ocean Bch.	Q06 472166	Ocean Bch	G. Stace	31-Dec-93
10 Ninety Mile	N03 030222	Below Te Arai	G. Stace	14-Dec-91
62 Ninety Mile, Scotts Pt.	N02 860416	Scotts Point	G. Stace	01-Apr-92
279 Ohope Bch	W15 648520		M. Jones	01-May-95
248 Omaha	R09 750385		G. Stace	01-Apr-95
319 Opotiki, Waiotahi Bch	W15 800482	West end, stream by public toilets	Stace & Prickett	29-Jan-96
162 Oreti Bch.	E46 425105	Invercargill	G. Stace	18-Sep-93
307 Orewa	R10 625108		N. Gardner	12-Mar-55
216 Otaki Bch.	R25 881490		B. Hazelwood, Brooke colln.	13-Feb-83
377 Papamoa	U14 028830		Stace & Smith	04-Jul-96
94 Parengarenga Harb	N02 075418	S. head sand spit "White beach"	G. Stace	19-Nov-92
340 Parengarenga, North Head	N02 101424	From Dyson's to head, Ngamaru Pt	G. Stace	21-Mar-96
336 Rarawa	N03 176210	north end to rocks	Stace & Morley	23-Mar-96
230 Te Arai Pt, Tomoana	R08 586592		G. Stace	26-Jul-94
237 Te Ngai+C108re	P04 900862	F. Thompson	F. Thompson	01-Jan-96
63 Te Paki Stream	M02 888392	Ninety Mile	G. Stace	01-Apr-92
240 Te WaeWae Bay	D46 908340		G. Stace	30-Sep-94
97 Te Werahi Bch	N02 812500		G. Stace	18-Oct-92
176 Tokerau	O03 446010		G.Stace	01-Oct-93
58 Tokerau	O04 461952	Wharf Rd end	G. Stace	01-Apr-92
258 Uretiti Bch.	Q07 426842		G. Stace	01-Mar-95
238 Waiheke Is		M. Morley	M.S.Morley	25-Nov-94
327 Waihi Bch, Tuna Rd.	U13 705185	East coast	N. Smith	20-Mar-88
208 Waikanae	R26 795356		Stace & Eagle	23-Feb-94
353 Waitarere Beach	S24 960710		N. Smith	01-Jan-96
379 Waiuku Gap to Maioro	R13 585300	N.Douglas. coll. see L18	N. Douglas	14-Feb-71

The locations in this table are plotted on a map of New Zealand in Fig. 1, and Fig. 2.

The few South Island locations are more likely the result of my collecting mainly in the north, and the Auckland Museum collection being mainly from the north. Many collectors still find distinguishing between toheroa and tuatua difficult when the specimens are of comparable size, but I would be grateful for information and specimens that are freshly dead and conjoined when collected, from any location not listed above, especially South Island or Wairarapa, to complete the picture.

Toheroa may not be thriving anywhere but Oreti. Accoring to Rapson (1951) they didn't always thrive in the south. "Small numbers also occur......at Te Waewae Bay on the north shore of Foveaux Straight in the South Island where, however only small sized toheroa are found" It is a different story today.

It is comforting to know that they ARE there, living all around the coast.

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[i] Cassie, R.M. "Population Studies on the Toheroa" Aust. Journal of Marine & Freshwater Research 3: Oct. 1955

[ii] Rapson, "The Toheroa *Amphidesma ventricosa* Gray (Eulamellebranchiata), Growth and Development", Australian Journal of Marine and Freshwater Research3 (2): 170 - 198, 1951

[iii] Greenway, J.P.C. M.A.F. FisheriesTechnical Report 128, 1974

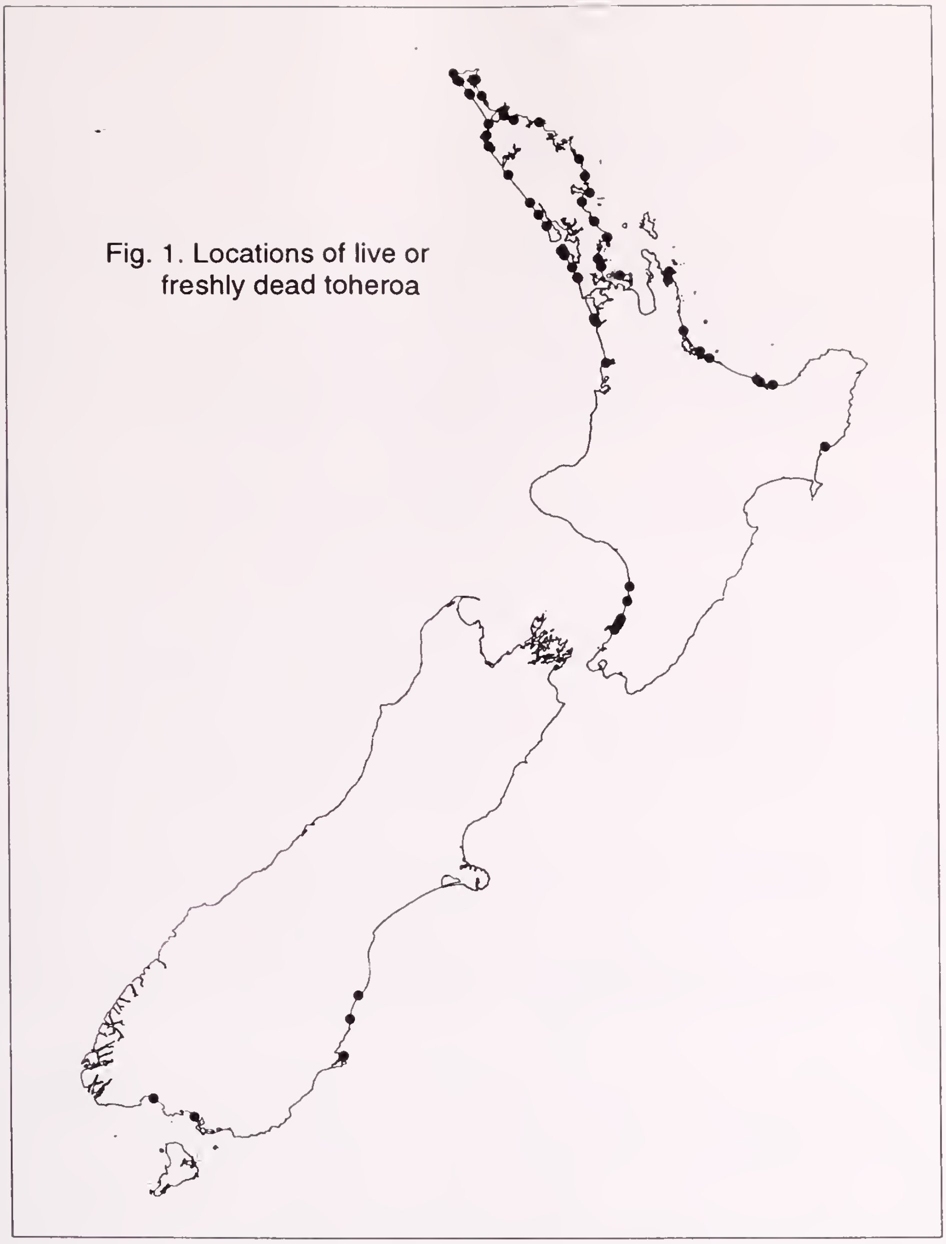


Fig. 1. Locations of live or freshly dead toheroa

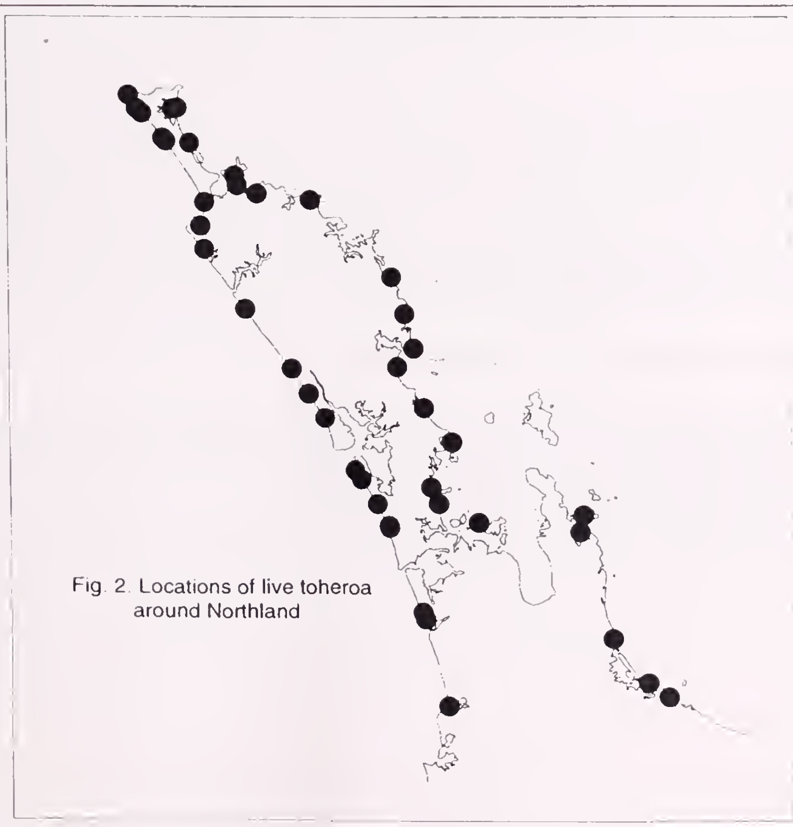


Fig. 2. Locations of live toheroa around Northland

The Library from Rae Sneddon

After many uncertainties with the revamp of the Museum and being ousted from our usual meeting place in the school room, things have settled down. We now meet in the supper room and our library is still in the same place in what is now the temporary shop. We still have access to it at our monthly meetings and members are able to return and borrow books as usual.

There have been some notable additions to our library since the beginning of the year, including two new papers by Bruce Marshall.

"A New Subfamily of the Addisoniidae Associated with the Cephalopod Beaks from the Tropical Southwest Pacific, and a New Pseudococculinid Associated with Condrichthan Egg Cases from New Zealand (Mollusca: Leptelloidea)", by Bruce A. Marshall

This is a paper on a new species in the superfamily Leptelloidea Dall, 1892 recently found on the Chesterfield Plateau, Coral Sea at 700 - 685 m. Helicopelta rostricola has been found feeding on detrital cephalopod beaks and is very small, being 1.90 mm across. It is a coiled shell with a shell muscle similar to a limpet and has an operculum. Another as yet unnamed species of Helicopelta has been found south of New Caledonia at 750 m and is even smaller, being 0.60 mm in width. Also described in this paper is a fourth species of the genus Tentaoculus off the coast of New Zealand. It is Tentaoculus balantiophaga, a limpet-like mollusc found feeding on spent skate egg cases off Castlepoint at 1335 m. Its length is 2.55 mm. This paper was published in The Veliger on July 1, 1966 and shows what interesting life can be found in the ocean depths.

"Seep faunas and other indicators of methane-rich dewatering on New Zealand convergent margins", by Keith B. Lewis and Bruce A. Marshall.

This paper describes the first samples of seep faunas found in New Zealand waters in October 1989 from 1100 - 1200 m off Mahia. Since then with the help of fishing vessels, more seep faunas have been located around our coasts. Blocks of shells cemented together with mud cement have been trawled and presented to the Museum of New Zealand for research. The shells include many undescribed species and are similar to forms living on decaying wood or to others from hydrothermal vents such as are found on the East Pacific Rise. Living specimens were found off Hawke Bay in 1994 - three large mussels related to Bathymodiolus at 900 m. Keith Lewis also discusses the geological settings of the seep sites round New Zealand.

Other new books in the library include:

"The Marine Fauna of New Zealand: Index to the Fauna. 3. Mollusca." by Hamish G. Spencer and Richard C. Willan

This is a valuable update of family and genus of the New Zealand Mollusca. It needs to be used in conjunction with Powell's "Mollusca of New Zealand"

"Seashells of Eastern Arabia", edited by S. Peter Dance

This is a beautifully produced book with excellent illustratons. There is an introduction describing the purpose of the book, a history of collecting in the area and the factors influencing the molluscan fauna. It also has a very good glossary of terms. The authors are Donald T. Bosch, S. Peter Dance, Robert G. Moolenbeek and and P. Graham Oliver.

"Manual of the Living Conidae", by Dieter Rockel, Werner Korn and Alan Jay Kohn. Volume 1: Indo -Pacific Region".

This is another well produced book with good illustrations. It covers the Indo - Pacific region only, there being further volumes to follow.

"Seashells of Central New South Wales", by Patty Jansen.

A useful book on the shells of the area illustrated with clear drawings of the New South Wales molluscs.

Also just to hand are 14 more papers by Bruce A. Marshall, some with co-authors, covering several years. These are:

Recent and Tertiary Trochaclididae from the Southwest Pacific (Mollusca: Gastropoda: Trochoidea)
A Revision of the Recent Calliostoma Species of New Zealand (Mollusca: Gastropoda: Trochoidea)
Dates of Publication and supraspecific Taxa of Bellardi and Sacco's "I molluschi dei terreni terziarii del Piemonte e della Liguria" and Sacco's (1890) "Catalogo paleontologica del bacine terziario del Piemonte"
Thysanodentinae: A New Subfamily of the Trochidae (Gastropoda)
Sex selective predation of deep-sea meiobenthic copepods by pectinacean bivalves and its influence on copepod sex ratios.
Osteopeltidae (Mollusca: Gastropoda): A New Family of Limpets Associated with Whale bone in the Deep sea.
Cocculinika myzorama, New Genus, New Species, A parasite copepod from a deep-sea wood-ingesting limpet.
Adelacerithiinae: A New Subfamily of Triphoridae (Mollusca: Gastropoda)
Calliostomatidae (Gastropoda: Trochoidea) from New Caledonia, the Loyalty Islands, and the northern Lord Howe Rise.
Molluscan and Brachiopod taxa introduced by F. W. Hutton in the New Zealand Journal of Science.
A Review of the New Zealand Recent Species of *Poirieria Jousseaume*, 1880 (Mollisca: Gastropoda: Muricidae) with Description of a New Species.
Zygomelom zodion, A new Genus and Species of Bathyal Volute from New Zealand.
Geology and tephrochronology of Raoul Island, Kermadec Group, New Zealand.

PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON.

PART XXVII.

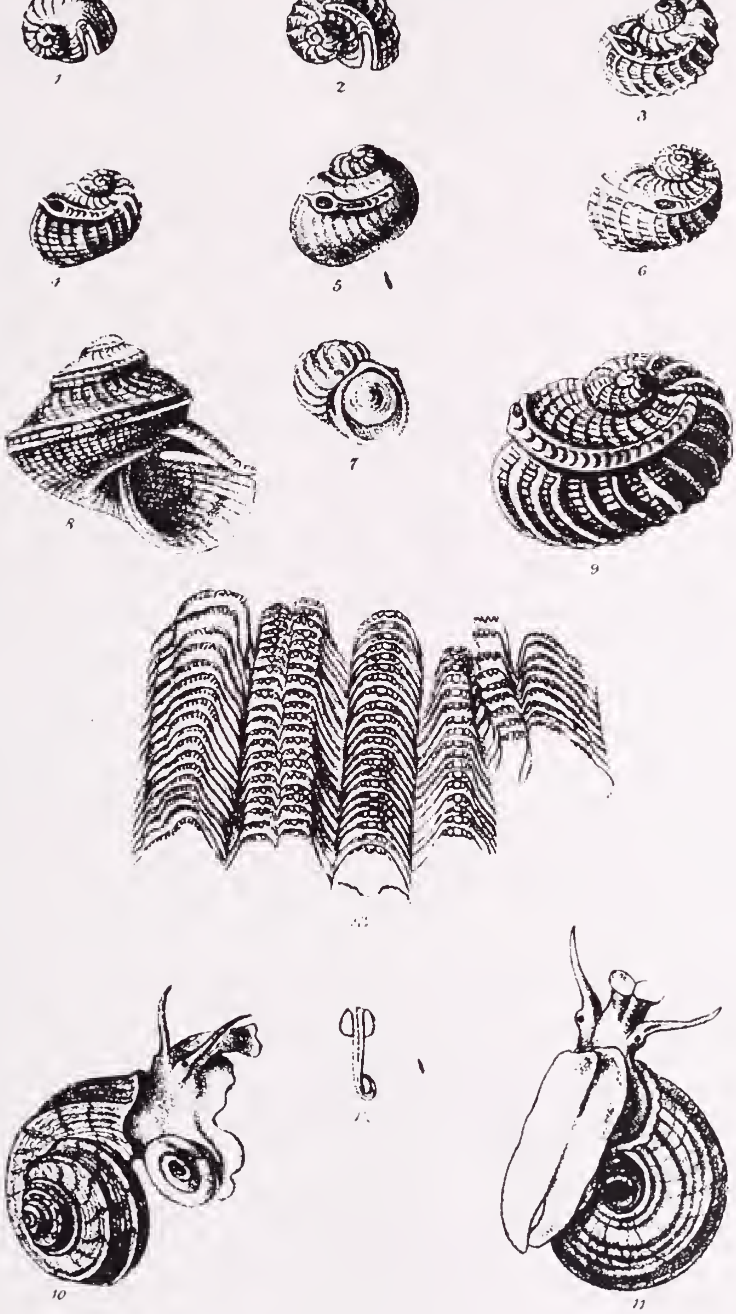
1859.

2. On a New Species of Mollusk of the Genus Scissurella, d'Orb. By S. P. Woodward, F.G.S. Communicated by Prof. Owen.

(Mollusca, Pl. XLVI.)

The little shell for which I propose the name of *Scissurella mantelli* was found in a sample of "Menaccanite" sand, collected in New Zealand by Mr. Walter Mantell. This sand also afforded a minute species of *Ringicula*, and numerous examples of *Calcarina*, *Siderolites*, and other Rhizopods. *Scissurella mantelli* resembles the type of the genus, *S. elegans*, d'Orb., but is rather larger, more depressed, more strongly ornamented, and has a longer *scissural band*. The specimen has been in my possession several years, but I did not think it worth publishing until I observed that it exhibited a character hitherto omitted in all descriptions of the genus, viz. that the shell when young *has no slit*. M. d'Orbigny's figures of *Scissurella elegans*, elaborate and highly magnified, represent the scissural band winding round all the whorls and extending to the extreme apex * ; but on referring to the specimens collected by Mr. Jeffreys at Spezzia, I found that the band really terminated within half a whorl of the aperture—a smaller proportional distance than in *S. mantelli*, and that during the first part of its life the *Scissurella elegans* also had a simple, entire lip, like the ordinary *Trochidæ*.

M. d'Orbigny's figures and description are faulty in a still more important respect; for Mr. G. Sowerby has observed that in the adult shell the fissure became closed at the aperture, leaving only a small foramen †: so that *Scissurella* presents three phases of growth—having a simple aperture when young, a slit when half-grown, and a foramen when adult. It is evident from the mode in which the slit is finally closed by the lateral expansion and union of its edges, that this change is final, and coincident with the termination of the shell's growth; whereas in the extinct *Trochotoma* the foramen must have been established at an early period, and continued to travel onward with the growth of the shell, as in the genus *Rimula*.



G B Sowerby

T. West imp.

Fig 1-7. Scissurella elegans. D'Orb. 8. S. Mantelli
„ 9. S. crispata. Flem. 10-13. Cyclostoma articulatum

Notes on two Epitoniums. from Nancy Smith

Some years ago Art Weil, Editor of "Epinet", the Epitonium news sheet, wrote to me that Dr. Norman Paschall said *Epitonium blainei* Clench and Turner, 1953 was a synonym of *Cirsotrema zelebori. C. blainei* is pictured in Compendium of Seashells, Abbott and Dance 1982, and described as "*Epitonium blainei*, Southern Florida, off shore to 44m, rare." The photograph is of the holotype, but not very clear. Dr. Paschall has been studying Epitoniid molluscs for many years and is a recognised expert, but as I could only find the one reference to *E. blainei,* I filed away the info. and did not think much more about it.

In July this year, on a visit to Australia I was excited to be given a shell labelled *Epitonium blainei* Florida. Not very good data! This shell is identical to our *Cirsotrema zelebori,* and raises very interesting questions. Powell 1979, gives the range of *C.zelebori* as "North Island; west coast, Muriwai beach, the north generally and down the east coast to the Bay of Plenty, common in shallow water on the open coast, in sandy locations and down to about 100 fathoms" However I have one *C.zelebori* from Foveaux Strait and examination of the shells held in the collection of the Auckland Museum suggest that it is found from the Three Kings Islands to Stewart Is., a considerable extension of range.

Ignoring the futile argument of what constitutes a species, and are subspecies valid, how does this mollusc appear only in N.Z. and Florida - the Eastern coast of U.S.A? Was it transported from one place to the other, was it once widespread but has now died out, or is it still widespread but not recognised under the same name? Perhaps the fossil record holds the answer.

PERIODICALS:-from Nancy Smith

GLORIA MARIS Vol.34 1995 parts 1-6

"GENUS NERITA , Alphabetical review," Part 1, treating the species up to *Nerita fulgurans.* This review by the Belgian Society for Conchology has colour plates of shells, sketch maps of localities, and brief descriptions. The General Conchology section has colour plates of 17 Marginellidae of Western Africa.

BASTERIA Vol. 59 nos 4-6, pp 89-169

Henk K. Mienis discusses two Quaternary Architectonicid species from outcrops in Aethiopia. *Torinia rosae* is concluded to be a junior synonym of *Heliacus (Heliacus) variegatus. Mangonuia (Awarua) aloysii* is problematical but provisionally a good species: *Pseudotorinia aloysii* (Selli, 1973).

Henk also discusses the status of *Heteroruga* Coen,1925 (Bivalvia: Donacidae), a record of *Trisidos semitorta* (Lamarck,1819) from Aden (Bivalvia: Arcidae) , and with R.Ortal, A sinistral specimen of *Melanoides tuberculata* (Mull.) from Israel (Prosobranchia: Thiaridae).

A new Miocene *Philine* is described by J.van der Linden and A.W. Janssen. A tiny bivalve, *Spondylus*, is found living in the umbilicus of a *Nautilis* , reported by Kent D. Trego. The morphological differences between two species of *Palliolum* (Bivalvia: Pectinidae) are argued by A.W.Janssen and H.H.Dijkstra. Some fossil *Helix* of the Canary Islands are discussed by Klaus Gross (et al). Hermann Leberecht Strack reports on a collection of South African chitons and J.J.Vermeulen presents notes on terrestrial molluscs of Java, Bali and Nusa Penida. All with excellent illustrations.

There is a new species of land snail, *Gulella,* named from NE Tanzania by B.Verdcourt and *Epitonium clathratulum* (Kanmacher,1798), unexpectedly found in the Dutch Delta area, is reported by Wetsteyn and Nieuwenhuize.

There is "in Memoriam Dr.C.Beets (1916-1995)". Dr. Cornelius Beets was an internationally acclaimed specialist of Indonesian Cainozoic molluscs.

APEX Vol. 11 (1) 5 Feb 1996

"The Oliva miniacia complex" with the description of a familiar, unnamed species (Studies on Olividae. 25) by Bernard Tursch and Dietmar Greifender. This 49 page review, illustrated with good black and white photographs, is not easy to read as it is couched in mathmatical-scientific jargon. There are many figures and tables to help explain the results of the morphometric system of distinguishing the species and subspecies within this group. Clear conclusions are reached and one of the forms is described as a new species: *Oliva mascerena* n. sp.

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CONTENTS

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THE STROMBACEA RE-VISITED

pt. I. STRUTHIOLARIA & APORRHAIS

John Morton

Struthiolaria is as old a New Zealander as *Apteryx*. . It looks like the fossil it virtually is, with its castellated ornament and elegant spire. The great majority of the family are truly fossil, originating in the Cretaceous and coming to a maximum in the Miocene and Pliocene. Clearly the group originated on the Antarctic continent, then quite tolerably temperate, and in New Zealand forms part of the palae-austral biota that includes *Fuchsia, Nothofagus* and our big dragonflies, *Uropetala*.

The oldest living struthiolariids hang on precariously in the subantarctic, *Perissodonta mirabilis* at Kerguelen and *P georgiana* at South Georgia. Both have the thin shells of Antarctic gastropods short of calcium. The two "modern" struthiolariids - if we may call them so - are *Struthiolaria papulosa* and *Pelicaria vermis*. living today in New Zealand The living animal reveals good grounds for the split into two genera. (despite Spencer and Willan's Checklist, and some early scepticism of my own). The only other living species is *Tylospira scutulata* with a narrow foothold in NeW South Wales. In the New Zealand Tertiary, *Struthiolaria, Pelicaria* and *Callusaria*, flourished and speciated from the Miocene on. The earlier east Australian genus *Singletonaria* had a simpler lip, and kept the family's earlier axial sculpture. *Struthiolarella* species, with axial sculpture reaching the body whorl, lived in South America up to the Miocene.

* * * * * * *

PERSONAL. Fifty years ago as I write, Struthiolaria was suggested to me by the redoubtable "Barney" McGregor for my master's research It was the most propitious advice . Struthiolaria tore me away from my under-graduate engrossment with vertebrate morphology and the bible of Goodrich, on a highway that had become a cul-de-sac. It took me back to live molluscs that were to be the absorbing interest of the first half of my zoological life. In a short couple of months I had found and read all then existing works of CM

Yonge and ranged through the volumes of the Journal of Marine Biology, from the Plymouth Laboratory. There - four years later - I was to become a table-holder and spend all three "vacations" of the academic year for the most care-free decade of my life. As I arrived at its gates, in front of the Citadel on Plymouth Hoe, on a long-lighted July evening, in 1950 I felt I had come home.. This utopian centre was open virtually free of cost to those drawn to pure research, Side by side with the eminent and great, the fledglings were taught to fly. The harsh Thatcher economics cut back and virtually destroyed Plymouth in the 1980s

The super-family Strombacea has never lost its interest for me . In later writing I was to cite it as one of those palpably "natural" groups embodying a "morphotype" or in Platonic terms an "eidos" - or creative idea., It is given actual exporession - in philosophic language "reatified" - in three families, the today small and near-basal APORRHAIDAE originating in the Jurassic; the also small but innovative STRUTHIOLARIIDAE and the large and successful but not overly progressive Indo-Pacific STROMBIDAE .

* * * * * * * * *

A P O R R H A I D A E

Aporrhaids in Triassic or Jurassic time were basically unspecialised among mesogastropods, just as they appear today. The spire is slender, with the sinuous axial sculpture that the earlier struthiolariids were to inherit. Aporrhaids are gleaners of finely divided plant detritus . In the way of early mesogastropods, the stomach has a crystalline style, serving as a windlass to draw in a mucus cord of partiches from the oesophagus.

One of the animal's most distinctive features is an incease in the size of the gill or ctenidium The filaments are long and narrpwly triangular, with their lateral ciliary tracts strongly developed. An enhanced water current can thus be passed through the mantle cavity. Not only does this serve as a cleansing mechanism; it could from the outset seem relevant to food-collecting. *Aporrhais* is a sedentary rather than a roving feeder. It lies for a certain period shallowly buried under a low sand mound. Inhalant and exhalant holes in the sand are established by using the proboscis as a piston. These two holes are kept open and lightly mucus-lined by the proboscis. Through

each hole a slender tentacle can be extended, the left cephalic tentacle through the inhalant hole, and through the exhalant a special azygous tentacle from the right side of the mantle. This is a characteristic of all the Strombacea. The maintained water current would serve to bring nutritive particles from the surrounding surface to accumulate under the canopy of the shell lip where they can be reached by the gleaning proboscis

The canopied shell lip is the family's second salient feature. It stabilises the shell that would otherwise roll like a spindle. It further provides a working area for the proboscis free of sand subsidence. It may also - like the rest of the axial ribbing - give protection from chipping away by predators such as sand crabs But as in all Strombacea this final elaboration is delayed until the adult shell has finished its growh.

.

The third outstanding feature in *Aporrhais* is its fast, spasmodic locomotion. This may also have arisen as a protection from predators such as starfish, being a development of the shock reaction not uncommon in mesogastropods. In *Aporrhais* this has been incorporated in the normal locomotor mode. The sole of the foot is long and narrowly triangular, and its plantar surface can be used in the typical way. The animal can even climb up and hang from the glass wall of an aquarium. *Aporrhais* has however largely given up the creeping-on-sole gait for a spasmodic lunging progression. The sole is first a little advanced, then the heavy body whorl raised up on the column or "neck" of the foot and allowed to fall forward half its length. The sole is then advanced and the lunge repeated.

Another fast movement is performed by *Aporrhais* with the aid of the operculum. When the shell is overturned, aperture up, the column is narrowed and extended and its plantar surface placed flat on the ground. Then by strong contraction of the column the shell is heaved over and its posture "righted". The operculum is small but strong, forming an oval plate strengthened with a chitinous ring and prolonged behind into a square spade that can, in righting, take purchase in the sand.

Tlhe surviving Aporrhaidae live in the cold boreal zone of the North Atlantic. *Aporrhais pes-pelicani* - studied at Plymouth - is found iin Europe and the British Isles, where there is also a second species, *A serresiana*. The North American aporrhaid, studied alive as dredged off St Andrew's, New Brunswick, is placed in a second

genus *Drepanochilus.* Both lines were already represented in Jurassic times

The fossils reveal that the aporrhaids went through an evolution and diversification of shell lip in the Jurassic just as bizarre as in the strombids of the present day. Their surviving members are tips of lineages long separated but in habis virtually identical. There were New Zealand aporrhaids, *Struthioptera,* in the Cretaceous beds of Hamuri Bluff limestone south of Kaikoura, probably of the same habits.

S T R U T H I O L A R I I D A E

When C M Yonge described the living *Aporrhais pes-pelicani* in 1937 he made the prescient remark that its gill could be evolving towards ciliary feeding, then only known in gastropods from the Calyptraeidae. This is indeed what must have happened when the Struthiolariidae crossed the Cretaceous-Tertiary divide as derivatives from the aporrhaids. Yonge heard of *Struthiolaria* only when I introduced it to him, on his (for me) memorable Auckland visit in 1948.

It is generally assumed that *Conchothyra* marked the New Zealand crossing point from an aporrhaid to a struthiolariid organisation. This genus is characterised by the shortening of the spire and the enlarged, rotund body whorl. The far more spacious pallial cavity so resulting would have accommodated the continuing enlargement of the gill that is such a feature of struthiolariids.

The whole shell shape was now to alter, by shortening of the spire, along with some loss of slender-footed agility.. The sole of the foot became more broadly oval, to carry the increased struthiolariid bulk. Creeping sole-on-ground now seems to be the general locomotor mode over sand, though the lunging motion may sometimes be resorted to on a less regular surface. The mode of burrowing with tube formation seems identical with that of *Aporrhais.* But the proboscis in struthiolariids is wider and more distensible, with its piston action further perfected and giving a tight fit to the burrow. When at the surface the region around the mouth expands to a convex circular disc.

The ciliary feeding of *Struthiolaria* was described by me in 1951, as illustrated in Plate II. By comparison with *Aporrhais*, this shows the relatively few, and mostly simple innovations required in a ciliary feeder. The *Struthiolaria* achievement is paralleled - as we now know - among soft benthic gastropods by the Turritellidae (*Maoricoplus* etc) and by *Umbonium,* an archaeogastropod, as discovered as a student by my friend Dr. Warren Judd.

By study of the ciliary tracts of the ctenidial filaments with carmine and carborunduim, it was soon clear that particles were being moved across the gill, rounded into a bolus at each filament tip Just behind the tips on the ventral (frontal) face of the gill, the line of boluses is drawn into a string. A series of these cords is twisted together and conveyed down the food groove, a wide ciliated tract on the right floor of the pallial cavity. This narrows as it leaves the pallial cavity to run along the head. It is now enclosed by tall, overlapping folds to mould the food string that issues just behind the right tentacle.

This propensity to produce mucus strings was the first activity that drew attention in living *Struthiolaria*. Its significance - at once suspected - could only be confirmed when I could see and sketch the proboscis turned back and the everted radula teeth forming a tiny grappie, helped by the jaws, that seized a portion of the string for swallowing.

Another advance upon *Aporrhais* for ciliary feeding is the mucus-secreting strip, ineptly called the "endostyle", and paralleled in *Crepidula*. The fore-gut also has modifications in line with the cilary feeding habit. The buccal mass is smaller, the salivary glands - large and with long ducts in *Aporrhais* - are now vestigial, while the mid-oesophagus - wide and crop-like in *Aporrhais* - is in *Struthiolaria* much narrowed. .

Perissodonta stands out as an annectant form. In its gill and gut it is essentially a modern struthiolariid. Its radula has a clear likeness to Aporrhais. It presents however the anomalous multiplication of the marginal teeth to four pairs, from which the primitive genus takes its name. The only adaptive significance I can suggest for this would be the addition of extra grapples for the new

role of pulling in the food string. If so this is an augmentation that modern struthiolariids have not continued.

REPRODUCTION.

It is in the incubation of eggs and larvae that the second progressive step is to be seen, this time within the struthiolariid family itself, with *Struthiolaria* and - still more - *Pelicaria* , and clearly in advance of *Perissodonta.* With the sexes separate as in nearly all prosobranchs, struthiolariids have a glandular (pallial) genital tract like that of *Aporrhais*, at an essentially primitive level among mesogastropod prosobranchs. In the. male the so-called "prostate" is a narrow open tract running forward from the genital pore. Seminal fluid passes forward from here by an open ciliated groove immediately to the right of the food groove. From just behind the right tentacle base, the seminal groove continues into a deep cleft along the recurved penis.

In the female *Aporrhais* the pallial genital duct has two divisions, a closed albumen gland, recurved lie a crook, leading to a capsule gland that remains ventrally unclosed. From its opening slit a short narrow backward diverticulum forms a receptaculum seminis. From the opening of the capsule gland, a ciliated genital duct on the right conducts eggs to the ground level at the front edge of the foot This is a primitive arrangement, adapted for affixing the eggs in small separate capsules direct to sand grains.

In *Perissodonta*, the female genital ducts are virtually unchanged from those of *Aporrhais.* But later struthiolariids have made a considerable advance. The ciliated egg groove no longer descends to the edge of the foot but terminates with the food groove, on the right side of the head. The mantle edge is brought close to it as the head withdraws into the shell. so that a string of egg capsules can pass into an oval brood pouch in the pallial wall. In *Struthiolaria papulosa*, there is an egg-string of up to 100 spherical capsules, each containing 20 or more clusters of a hundred or so eggs. These are lightly yolked, and are incubated in the brood pouch until 4-lobed veliger larvae are released at an advanced stage. Veligers are freely active when liberated in the laboratory and their activity would suggest at least a brief spell of independent swimming in the plankton. About their planktonic life, I have been able to find out little. Several prolonged plankton nettings over the Cheltenham beach at high tide never secured *Struthiolaria* larvae.

On their escape from the brood-pouch these larvae formed beautiful objects to observe in a laboratory dish Everything happening inside the mantle cavity and the visceral mass could be observed by transparency, including the tiny 1 mm long crystalline style rotating in the stomach at 30 turns a minute. The bright yellow spot on each wing of the velum circumstantially reproduces the similar spots on the 6 lobes of the *Aporrhais* velum, observed by Dr. Marie Lebour at Plymouth.

Pelicaria vermis, in strong contrast to *Struthiolaria papulosa*, has no swimming veliger. No more than about a dozen large yolked eggs enter the pouch, enclosed in a long ovate-cylindrical capsule. The young emerge as crawling benthic embryos, small replicas of the adult. The larva undergoing pouch development, with a reduced velum of two short lobes, is shown in Plate III. The "nucleus" or initial whorl of the larval shell is very distinctive, being large and capuliform (paucispiral), as compared with the small, multispiral protoconch of *Struthiolaria. papulosa*..

Here emerges the clear explanation of the separation of the *Struthiolaria* and *Pelicaria* back in the New Zealand late-Miocene. *Pelicaria* species are thus entirely incubatory, with large, yolky eggs and a big, cap-shaped protoconch. It is significant that *Pelicaria vermis* has the narrower geographical range, stopping at Cook Strait. *Struthiolaria* species all had larvae equipped for at least brief swimming, if we may judge from their small, tightly coiled, multispiral protoconch. The living species *Struthiolaria papulosa* has a wider geographical range, including the North, South and (with the sub-species *"gigas"*) Stewart Island. In this respect east Australia's *Tylospira scutulata* - with a restricted geographical range in New South Wales - is like *Pelicaria* with a large protoconch and by inference retention of larvae.

Not all the problems posed by *Struthiolaria* have been unravelled. Calling for special remark is the huge expansion of the receptacum seminis, or sperm-storage sac in the female, beyond any apparent functional need. It contains vast amounts of sperm, with the heads of normal "eupyrenic" sperm lined up in a densely staining band along the epithelium. Many mesogastropods including *Struthiolaria* have sperms of a second type, "oligopyrenic" - with low nucleic acid, large and vermiform (up to 100 μ), and swimming by an undulating

membrane Some have explained these sperms as nurse cells which degenerate in the receptaculum to nourish the normal sperms. But there are several mesogastropods in which they can have a transporting function, with normal sperms attaching by their heads The whole structure, called a "spermatozeugma", can swim strongly in the sea and there are some aphallate genera - including *Ianthina* and *Cerithiopsis* - where fertilisation is achieved by the active entry of the carrier sperms into the oviduct. This is surmised as likely to happen in Turritellidae and Potamididae where the oviduct is left wide open lie a slit sleeve. Struthiolariids have the capsule gland still open, and despite the persistence of a penis I am not even satisfied that copulation takes place.

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HISTORY

All our present knowledge points to the´derivation of the Struthiolariidae from an aporrhaid forbear on the shores of an Antarctic land mass, with their present distribution achieved by radial spread. The two *Perissodonta* species are the most southern survivors, closest to the primitive stock. Here the multispiral apex with unabbreviated development points to a clearly primitive status. The general expectation - by Gunnar Thorson's rule - would be for the suppression of long larval life and development of a bulbous apex to happen in colder seas. Here the phylogenetic logic would seem to have prevailed over the ecological.

The Australian fossil *Singletonaria* like the living Australian *Tylospira scutulata* has spirally sculpted, convex, brephic whorls and capuliform apex. They could have arisen earlier than the New Zealand radiation, perhaps in the Oligocene. The living *Tylospira* has a simplified lip and a gerontic overgrowth of the later whorls by an enamelled callus layer.

The basal status of the Aporrhaidae is attested also in the peri-oesophageal nerve ring.. In *Aporrhais pes-pelicani*, the cerebropleural and cerebropedal connectives are primitively long, as are also the pleuropedals. The pedal ganglia lie more posteriorly, having not attained the forward position they occupy in *Struthiolaria*. The subintestinal ganglion retains its primitive position remote from the nerve ring The more advanced and concentrated nerve ring of *Struthiolaria papulosa* is shown in Fig. IV.

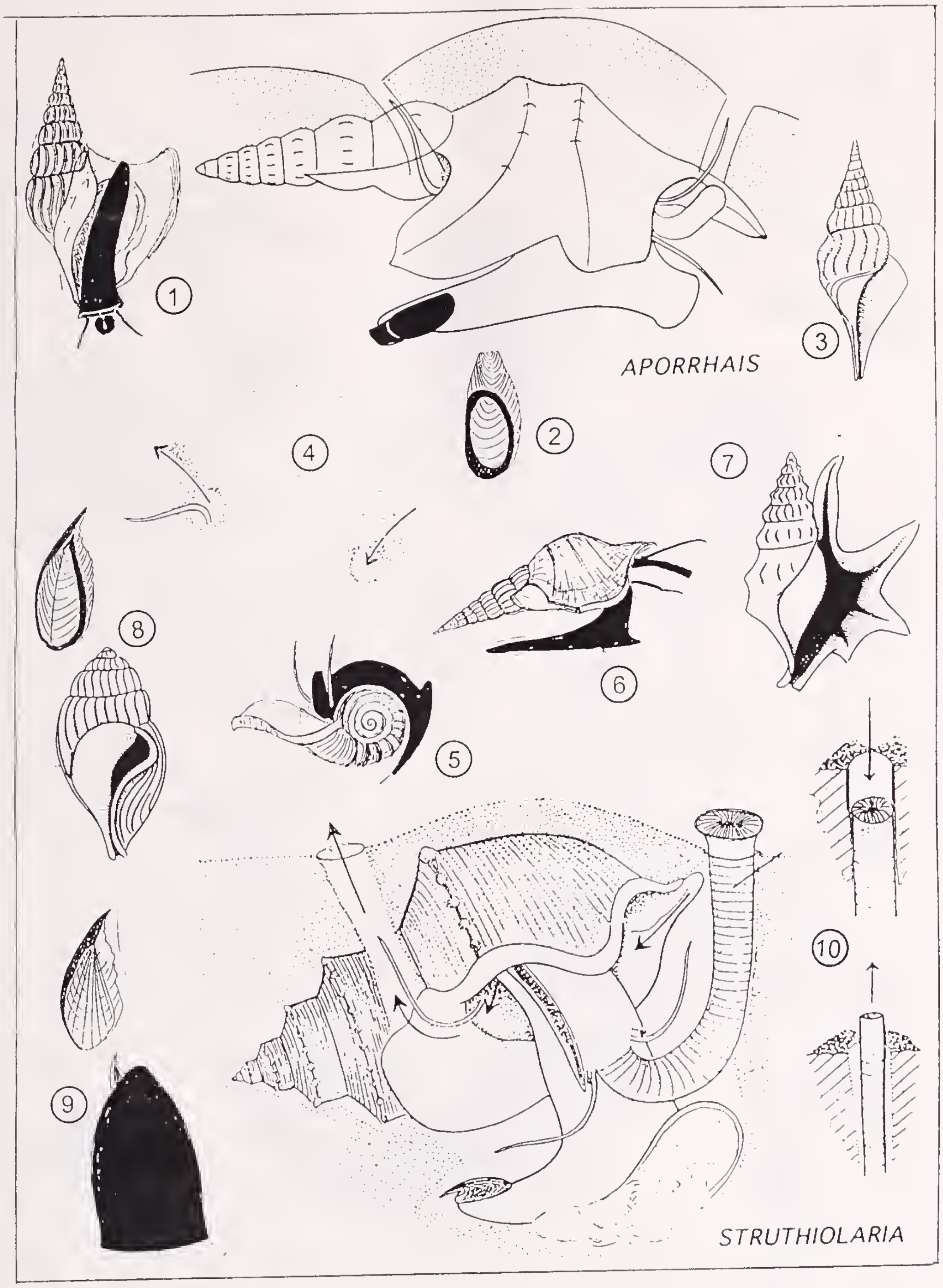
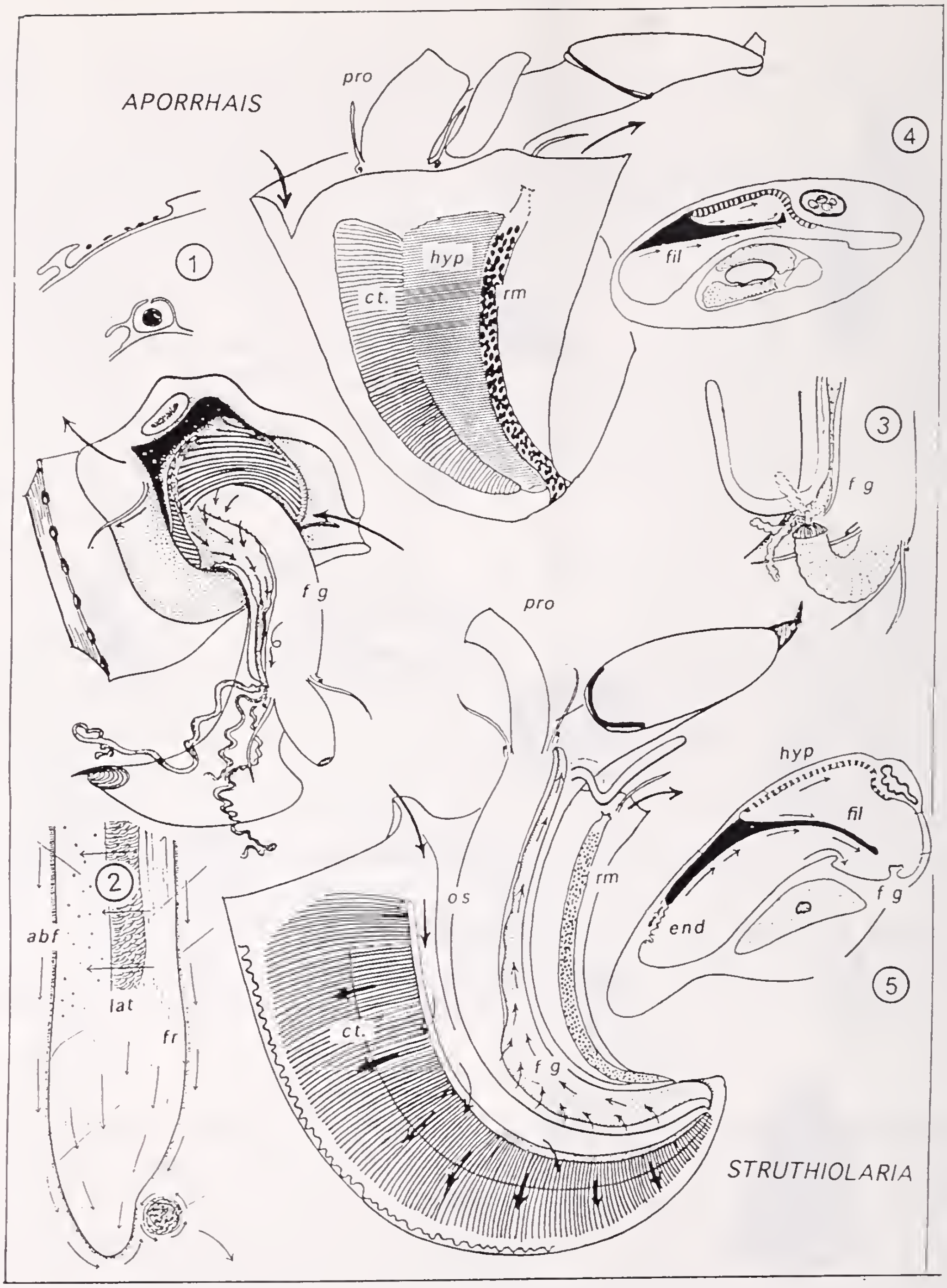


PLATE I

(top centre) *Aporrhais pes-pelicani*, in situ in sand; (bottom centre) *Struthiolaria papulosa*, in same view
I *Drepanochilus occidentalis*, showing extent of sole. 2 *Aporrhais pes-pelicani*, operculum. 3 *Aporrhais pes-pelicani*, juvenile shell. 4 *Struthiolaria papulosa*, inhalant and exhalant tubes in sand. 5. *Drepanochilus occidentalis,* righting movement. 6 *Drepanochilus occidentalis,* body whorl raised for lunging movement. 7 *Aporrhais pes-pelicani.* 8 *Perissodonta georgiana,* with operculum. 9 *Struthiolaria papulosa*, operculum and sole. I0 *Struthiolaria papulosa,* formation of sand tubes by proboscis.

PLATE II



(top centre) *Aporrhais pes-pelicani*, pallial organs without dissecton

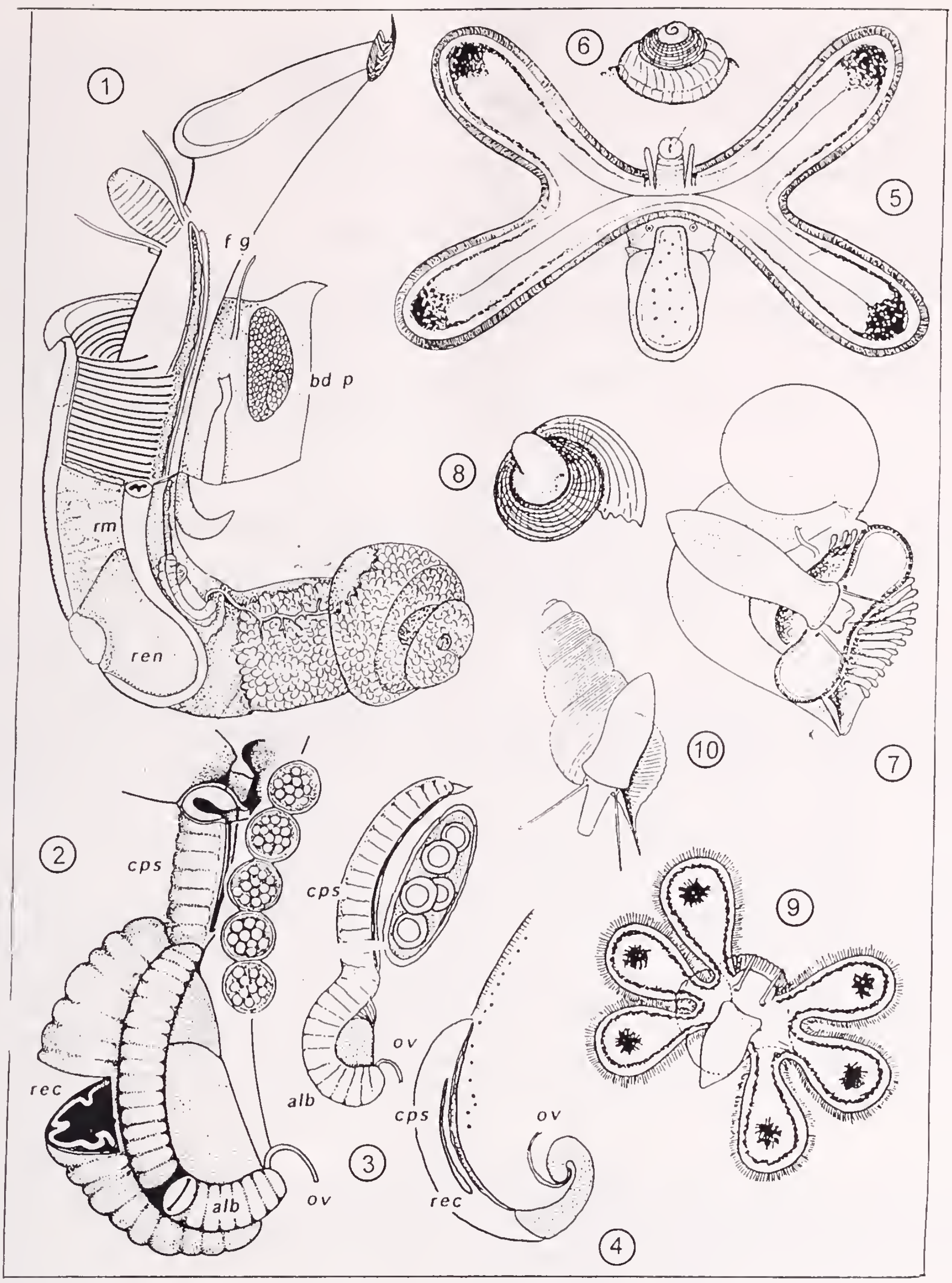
(bottom centre) *Struthiolaria papulosa* pallal cavity opened by incision on the right side, to show the ctenidium and food groove

(left middle) *Struthiolaria papulosa*, with the animal extended from the shell, to show the foods groove with mucus strings issuiing,

l. *Struthiolaria*, food groove in section, within and outside the mantle cavity. 2 *Struthiolaria*, tip of a gill filament showing ciliary currents and bolus of food particles. 3. *Struthiolaria*, removal and ingestion of food string. 4 *Aporrhais*, cross section of the mantle cavity. 5 *Struthiolaria*, cross section of the mantle cavity.

abf abfrontal cilia; *bol* food bolus *ct.* ctenidium; *end* "endostyle" *f g* food groove; *fil* gill filament; *fr* frontal cilia; *hyp* hypobranchial gland; *lat* lateral cilia; *os* osphradium; *pro* proboscis; *rm* rectum

PLATE III



I *Struthiolaria papulosa*, female, showing the reproductive system, with mantle cavity opened to reveal the brood pouch.
2. *Struthiolaria papulosa*, female genital ducts, dissected to show internal structure, and with portion of egg string.
3. *Pelicaria vermis*, female genital ducts and egg capsule.
4 *Drepanochilus occidentalis*, female genital duct and eggs.
5. *Sruthiolaria papulosa*, 4 -lobed veliger larva, just released.
6 *Struthiolaria papulosa*, shell apex. 7. *Pelicaria vermis*, reduced (2-lobed) veliger, from the brood pouch. 8 *Pelicaria vermis*, shell apex. 9 *Aporrhais pes-pelicani*, 6-lobed veliger larva. I0 *Aporrhais pes-pelicani*, 4-whorled, post-settlement stage.

alb albumen gland; *bd p* brood pouch; *cps* capsule gland; *ov* ovarian duct; *rec* receptaculum seminis; *rm* rectum; *f g* food groove; *ov g* ciliated oviducal groove; *ren* renal organ.

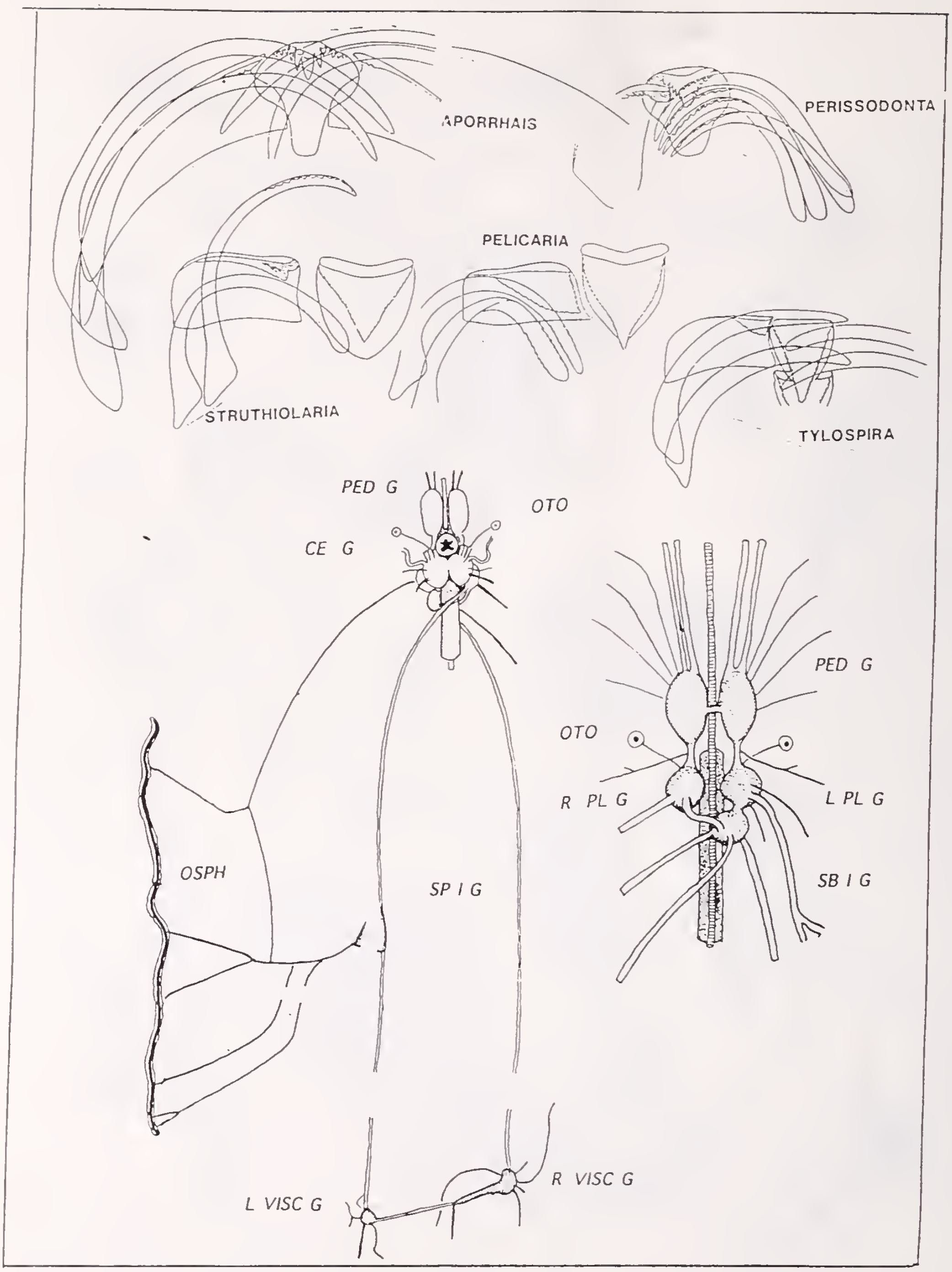


PLATE IV

(above) Radula teeth of *Aporrhais* and the struthiolariid genera.

(below) *Struthiolaria papulosa.* *(left)* Central nerve ring and visceral loop, in dorsal view. *(right)* nerve ring, ventral view, enlarged.

CE G cerebral ganglia; *L PL G* left pleural ganglion; *L VISC G* left visceral ganglion; *OSPH* osphradium; *PED G* pedal ganglia; *R PL G* right pleural ganglion; *SB I G* subintestinal ganglion; *SP I G* supraintestinal ganglion

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NEW ZEALAND MOLLUSC NAME CHANGES FROM POWELL (1979) TO SPENCER & WILLAN (1996)

by Margaret S. Morley

Introduction

When the manual, Index to the Fauna: 3. Mollusca (Spencer & Willan 1996) was published , the Marine Departments of the Auckland Museum decided to cite it as the reference for mollusc names in papers. Prior to this time, Mollusca of New Zealand (Powell 1979) had been used.

The numerous, but necessary name changes, created an enormous increase in the work required to identify a mollusc and proof-read a species list. Instead of a quick, familiar check in Powell 's book for the description and spelling, it was necessary to use both books. Even after the required species was found in the Spencer & Willan index, it was not always readily found on the page, often being under an unfamiliar name and/or in a different family. Although the previous name was given and a page reference to Powell, the task tended to be slow and frustrating. When I realised that this would be a recurring problem, I decided to produce a user-friendly alphabetical list .

About the list

1 It gives the earlier name (Powell 1979) and the updated name and authority (Spencer & Willan 1996) with the page number in Powell's book. This number provides a short cut to the description of the mollusc. An asterisk indicates a change in the authority of that mollusc.

2 New species described since Powell 1979 but prior to 1993 and included in Spencer & Willan are **not** included.

3 New species described or name changes made since 1993 are **not** included. The only exceptions to this are the ***Calliostoma*** which are updated to **Marshall (1995).**

4 Molluscs that are **unchanged from Powell (1979)** ie still have the same name and authority, are **not** included.

The list is proving to be a great time-saver and well worth the effort to produce. As well as being quicker, one simple list reduces the chance of mistakes in copying. The Powell page number avoids using either index. What a relief! I hope you agree and are encouraged to use the updated names.

Despite much proof-reading there may be some errors. Please let me know if you spot any.

MARINE & FRESH WATER		
MOLLUSC NAME CHANGES		
	Calliostoma spp. updated to Marshall (1995)	
*Key * = change in authority*	*Species additional to Powell 1979 not included*	
Pow p = Powell page number		
Please report omissions or errors to	Margaret Morley (09) 576 8323	
Powell 1979	**Spencer & Willan 1995**	**Pow p.**
POLYPLACOPHORA		
Aerilamma (Valerichiton) murdochi	*Plaxiphora murdochi* Suter, 1905	26*
Amaurochiton glaucus	*Chiton (Amaurochiton) glaucus* (Gray, 1828)	27
Callochiton puniceus	*Callochiton kapitiensis* Mestayer, 1926	24*
Callochiton subeudoxa	*Callochiton empleurus* (Hutton, 1872)	23*
Craspedochiton rubiginosus oliveri	*Acanthochitona (Notoplax) rubiginosa* (Hutton, 1872)	31*
Craspedochiton rubiginosus rubiginosus	*Acanthochitona (Notoplax) rubiginosa* (Hutton, 1872)	31
Diaphoroplax biramosus	*Plaxiphora biramosus* (Quoy & Gaimard, 1835)	26
Frembleya egregia	*Plaxiphora (Frembleya) egregia* (H. Adams, 1866)	27*
Guildingia obtecta	*Plaxiphora obtecta* Pilsbry, 1893	26
Ischnochiton granulifer	*Ischnochiton luteoroseus* Suter, 1907	23*
Maorichiton caelatus	*Plaxiphora caelata* (Reeve, 1847)	26
Maorichiton schauinslandi	*Plaxiphora caelata* (Reeve, 1847)	26*
Notoplax aupouria	*Acanthochitona (Notoplax) aupouria* (Powell, 1937)	30*
Notoplax cuneata	*Pseudotonicia cuneata* (Suter, 1908)	30
Notoplax facilis	*Acanthochitona (Notoplax) facilis* (Iredale & Hull, 1931)	30*
Notoplax latalamina	*Acanthochitona (Notoplax) latalamina* (Dell, 1955)	30*
Notoplax mariae	*Acanthochitona (Notoplax) mariae* (Webster, 1908)	30
Notoplax violacea	*Acanthochitona (Notoplax) violacea* (Quoy & Gaimard,1835)	31
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Subonoba delicatula	*Onoba delicatula* (Powell, 1933)	110*
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Subonoba paucicostata	*Onoba paucicostata* (Powell, 1931)	112*
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Dosina zelandica crebra	Dosina crebra (Hutton, 1873)	427
Dosina zelandica zelandica	Dosina zelandica Gray, 1835	427
Ennucula strangei	Leionucula strangei (A. Adams, 1856)	357
Ennucula strangeiformis	Leionucula strangeiformis (Dell, 1956)	357*
Gari hodgei (not in Powell 1979)	Gari (Psammobia) convexa (Reeve, 1857)	
Gari lineolata	Gari (Psammobia) lineolata (Gray, 1835)	418
Gari stangeri	Gari (Gobraeus) stangeri (Gray, 1843)	418
Glycymeris (Grandaxinaea) laticostata	Tucetona laticostata (Quoy & Gaimard, 1835)	365
Gregariella barbata	Trimusculus barbatus (Reeve, 1858)	373
Jupiteria zealedaformis	Saccella hedleyi (Fleming, 1951)	359*
Lasaea rubra hinemoa	Lasaea hinemoa Finlay, 1928	389
Lasaea rubra rossiana	Lasaea rossiana Finlay, 1928	389
Ledella finlayi	Yoldiella finlayi (Powell, 1935)	360*
Lima colorata zealandica	Lima zealandica Sowerby, 1876	381
Limatula aupouria	Limatula (Limatuletta) aupouria Powell, 1937	382
Limatula pygmaea	Limatula (Antarctolima) pygmaea (Philippi, 1845)	382
Lithophaga (Zelithophaga) truncata	Zelithophaga truncata (Gray, 1843)	374
Longimactra elongata	Oxyperus (Pseudoxyperas) elongata (Quoy & Gaimard, 1835)	414
Mactra (Cyclomactra) ovata ovata	Cyclomactra ovata (Gray, 1843)	413

Mactra (Cyclomactra) ovata tristis	*Cyclomactra tristis* (Reeve, 1854)	413*
Mactra (Maorimactra) ordinaria	*Maorimactra ordinaria* (E.A. Smith, 1898)	414*
Monia zelandica	*Pododesmus zelandicus* (Gray, 1843)	383
Myadora striata	*Myadora striata* (Quoy & Gaimard, 1835)	432*
Mysella aupouria - no name change	*accidental omission in S & W*	395
Mytilus edulis aoteanus	*Mytilus edulis galloprovincialis* Lamarck, 1819	372*
Neilo rugata	*Neilo annectens* Powell, 1931	362*
Nemocardium (Pratulum) pulchellum	*Pratulum pulchellum* (Gray, 1843)	413
Notirus reflexus	*Irus (Notirus) reflexus* (Gray, 1843)	425
Notopaphia elegans	*Irus (Notopaphia) elegans* (Deshayes, 1854)	425
Nucula (Linucula) gallinacea	*Varinucula gallinacea* (Finlay, 1930)	356*
Nucula (Linucula) recens	*Linucula recens* Dell, 1956	357
Nucula dunedinensis	*Lamellinucula dunedinensis* (Finlay, 1928)	355*
Offadesma angasi	*Periploma (Offadesma) angasi* Crosse & Fisher, 1864	433
Ostrea charlottae	*Tiostrea chilensis lutaria* (Hutton, 1873)	375*
Ostrea heffordi	*Tiostrea chilensis lutaria* (Hutton, 1873)	376*
Ostrea lutaria	*Tiostrea chilensis lutaria* (Hutton, 1873)	375*
Paphies (Mesodesma) subtriangulata porrecta	*Paphies subtriangulata* (Gray, 1828)	416
Paphies (Mesodesma) subtriangulata quoyii	*Paphies donacina* (Spengler, 1793)	416*
Paphies (Mesodesma) subtriangulata subtriangulata	*Paphies subtriangulata* (Gray, 1828)	416*
Paphies (Mesodesma) ventricosa	*Paphies ventricosa* (Gray, 1843)	416
Paphies australis	*Paphies australis* (Gmelin, 1791)	415*
Pholadidea spathulata	*Pholadidea suteri* Lamy, 1926	429*
Pholadomya maoria	*Parilimya maoria* (Dell, 1963)	431*
Protothaca (Tuangia) crassicosta	*Protothaca crassicosta* (Deshayes, 1835)	425
Solemya parkinsoni	*Solemya (Solemyarina) parkinsoni* E.A. Smith, 1874	363
Soletellina siliqua	*Soletellina siliquens* Willan, 1993	419*
Sphaerium (Sphaerinova) novaezelandiae	*Musculium novaezelandiae* (Deshayes, 1853)	422*
Spisula (Crassula) aequilateralis	*Spisula (Crassula) aequilatera* (Deshayes, 1854)	414
Tellina (Macomona) liliana	*Macomona liliana* (Iredale, 1915)	417*
Tellina (Peronidia) edgari	*Tellinota edgari* (Iredale, 1915)	417*
Tellina (Peronidia) gaimardi	*Peronaea gaimardi* (Iredale, 1915)	417*
Tellina (Tellinella) charlottae	*Serratina charlottae* (E.A. Smith, 1885)	417*
Tellina (Tellinella) eugonia	*Serratina eugonia* (Suter, 1913)	417*
Tellina (Tellinella) huttoni	*Moerella huttoni* (E.A. Smith, 1885)	417*
Tellina (Tellinella) spenceri	*Rexithaerus spenceri* (Suter, 1907)	417*
Thracia (Hunkydora) australica novozelandica	*Hunkydora australica novozelandica* (Reeve, 1859)	433
Thyasira (Parathyarsira) resupina neozelanica	*Parathyarsira neozelanica* Iredale, 1930	387
Thyasira peroniana peregrina	*Thyasira peregrina* (Iredale, 1930)	386
Thyasira peroniana waikanae	*Thyasira waikanae* Fleming, 1950	387
Vasoniella (Divariscintilla) maoria	*Divariscintilla maoria* Powell, 1932	398
Venericardia purpurata	*Venericardia (Purpurocardia) purpurata* (Deshayes, 1854)	407
Venericardia reinga	*Venericardia (Purpurocardia) reinga* Powell, 1933	407
Venerupis (Paphirus) largillierti	*Ruditapes largillierti* (Philippi, 1849)	426
Zeacopagia disculus	*Pseudoarcopagia disculus* (Deshayes, 1855)	418
CEPHALOPODA		
Architeuthis kirki	*Architeuthis dux* Steenstrup, 1857	442*
Architeuthis longimanus	*Architeuthis dux* Steenstrup, 1857	442*
Architeuthis stocki	Architeuthis dux Steenstrup, 1857	442*
Architeuthis verrilli	*Architeuthis dux* Steenstrup, 1857	442*
Argonauta nodosa	*Argonauta nodosa* Solander, 1786	445*
Enoploteuthis neozelanica	*Enoploteuthis galaxias* Berry, 1918	440*
Histioteuthis cookiana	*Histioteuthis atlantica* (Hoyle, 1885)	441*
Megalocranchia pardus	*Teuthowenia pellucida* (Chun, 1910)	443*
Megalocranchia richardsoni	*Teuthowenia pellucida* (Chun, 1910)	443*
Moroteuthis (Moroteuthopsis) ingens	*Moroteuthis ingens* (E.A. Smith, 1881)	441
Octopus zelandicus	*Octopus maorum* Hutton, 1880	444*
Pinnoctopus cordiformis	*Octopus cordiformis* (Quoy & Gaimard, 1832)	444
Robsonella australis	*Octopus campbelli* (E.A. Smith, 1902)	444*
Sepioteuthis bilineata	*Sepioteuthis australis* Quoy & Gaimard, 1832	440
Teuthowenia antarctica	*Galiteuthis glacialis* (Chun, 1906)	443*
Tremoctopus violacea	*Tremoctopus violacea gracilis* (Eydoux & Souleyet, 1852)	445*

A Note From Richard Willan

Supplementary information from the authors of the book "The Marine Fauna of New Zealand: Index to the Fauna: 3 Mollusca"

by Richard C. Willan and Hamish G. Spencer

We have been very pleased to hear that this book has proven useful. According to those who dip into it regularly, our intention of updating Baden Powell's "New Zealand Mollusca" has been achieved. Had it not been for that pre-eminent starting point, we would have found our task infinitely harder. We would welcome any corrections or additions to our book for a future edition. The next edition will probably be an electronic version of the checklist on the World Wide Web, so that it can be updated rapidly and accessed widely. Again, comments would be welcome.

Although the manuscript for our book was accepted in May 1995 and the title page says 1995, the book did not actually get published until February 1996. Therefore, whenever the book is cited as a reference, the date of publication should be given as 1996.

The book was published by the National Institute of Water and Atmospheric Research Ltd as part of the a bibliographic series on the marine fauna of New Zealand (Eliot Dawson's book on the Protozoa which came out in 1992 was the first in this series). These works are also catalogued as part of the long established series of New Zealand Oceanographic Institute Memoirs. Given this marine background, we started by compiling the checklist and bibliography only for marine molluscs but it soon became apparent that the amphibious (Ellobiidae, Siphonariidae, Hydrobiidae, Assimineidae), estuarine (Amphibolidae, Hydrobiidae, Batillariidae) and freshwater (Melanopsidae, Hydrobiidae, Lymnaeidae, Latiidae, Ancylidae, Physidae, Planorbidae, Hyriidae, Sphaeriidae) molluscan families could not be neglected. They are aquatic too and arbitrarily excluding them would be doing them an injustice. Therefore we decided to make the book fully comprehensive by including not only these families but all the land snails too so that the work covered the entire New Zealand molluscan fauna. We are certain the book is better for their presence.

Because we included all these "non-marine" species and subspecies we were better able to assess the size of the New Zealand molluscan fauna as at 31 December 1993 (2510 species and subspecies). This explains why the land snails are included in a book that would appear at first glance to cover just the marine molluscs.

Twenty Years Ago

Nancy Smith

Richard Willan entitled an article "The Brachiopods of Stewart Is" then listed all the molluscs found in Paterson inlet when he went on an expedition with an "assorted bunch of Australian and New Zealand biologists and oceanographers" He never mentioned brachiopods again!

Balcis articulata was still an exciting new find, having been first recorded in N.Z. as recently as 1971.

Land snails were listed from Mt Wellington lava fields, Le roy's bush, Northcote and Waipoua Forest.

An article on New Zealand stony corals with clear drawings by N.W. Gardner is still useful today.

For those of you who find the "worm shells" difficult "Notes on Local Vermetids" an illustrated description of *Novastoa, Dendropoma, Stephopoma* and *Serpulorbis* might help especially if taken in conjunction with Powell.

The Diminishing Schizoglossa

by Peter Poortman

The unusual shell shape of the native land snail Schizoglossa caught my eye when I first saw Dr. Powell's illustrations many years ago. Resembling a Haliotis but without the row of holes, it sits on the back of a slug which is several times the length of the shell. With a shell length of up to 5cm, *Schizoglossa major* must have been a very impressive animal. Unfortunately however, this species became extinct somewhere between 100 to 500 years ago. Evidently it's range extended west of Hamilton from Port Waikato to just north of Mt. Pirongia.

Four other species are still living in various parts of the North Island. The largest of these, *Schizoglossa gigantea* was thought to be extinct until a live specimen was discovered at the summit of Mt. Hikurangi in the late 1970's. Prior to this it had only been recorded as subfossil in caves from East Cape to Lake Waikaremoana. Quite possibly it is now truely extinct. *Schizoglossa novoseelandica* occurs between Hamilton and Taihape, and *Schizoglossa novoseelandica barrierensis* is only found on Great Barrier Island. *Schizoglossa worthyae*, once recorded from isolated patches between Hokianga and Rotorua, now appears to be quite scarce.

Schizoglossa is endemic to New Zealand and is carnivorous and egg laying. Interestingly it is considered to be an 'advanced' Rhytidid which is in the process of gradually discarding it's shell.

I am rather fond of Schizoglossa because a rare *S. major* shell was the first native land snail I ever found, and this was entirely by chance. About 22 years ago I was rock climbing on limestone bluffs in the Aramiro Valley west of Hamilton when I noticed the large but partially broken shell lying at the top of a bluff. Needless to say I spent the rest of the afternoon searching for more but only managed to turn up some old *Rhytida greenwoodi* shells.

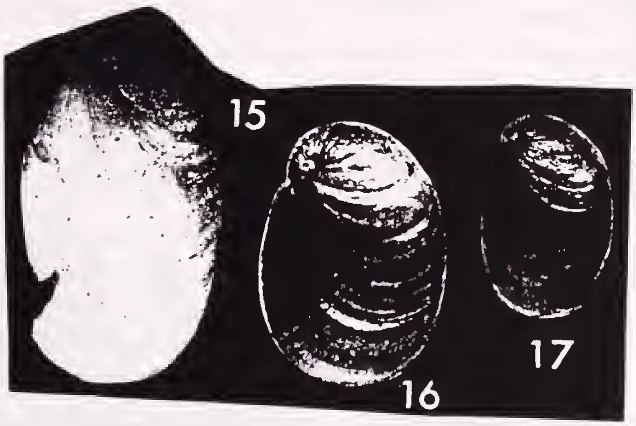
Last year I thought I would try my luck again and returned to the Aramiro valley. I could not locate the original bluffs but did manage to find a much larger area of bluffs beside the road further into the valley. After obtaining permission from the farmer my first stop was a small patch of native bush on a fairly steep south facing slope. This yielded a good number of *S. novoseelandica* shells as well as some *Rhytida greenwoodi* shells in good condition. The rest of the day was tiring work but just as discouragement began to set in I was rewarded with a small (32mm) but intact *S. major* shell.

Bouyed by this success I made an impetuous decision to search for evidence of *S. gigantea* on Mt. Hikurangi, East Cape, the following month. From the end of a long gravel road Mt. Hikurangi is a deceptively long steady climb through farmland to a tramping club hut on it's northwestern side. Carrying 4 litres of water plus a tent did not make it any easier but the increasingly spectacular views did. At the hut I dumped my pack and not being sure where exactly to look, went searching in the nearby bush. No shells but much evidence of wild pigs, one of which bolted from cover approx 15 meters from where I was searching. That night the tent came in useful after the sound of rats in the hut became too unsettling. The next day, still

unsure where to look but knowing that S. gigantea was recorded from the NW side, I decided to take a 'short cut' to the summit instead of taking the track. Not a wise decision as the slope is very steep and the vegetation mostly consists of a very spikey plant. The top of the mountain is covered with large loosely packed boulders, the interspaces of which form numerous deep and inaccessible hollows. It is easy to see how the species remained undetected and safe from predators for so long, however it must have been very hardy to survive the cold which was evident at such an altitude. I returned home empty handed, however a bag of leaf litter provided good pickings for Jim Goulstone.

Six months later I returned to the Aramiro valley to continue searching from where I left off last time. Again I was rewarded with a good 40mm *S. major* shell. Further north at bluffs south of Waikorea I found a small piece, and by the time I got to Limestone Downs, approx 18k south of Port Waikato, I had run out of steam. Limestone Downs is a large expanse of limestone bluffs which I am sure contain some fine *S. major* shells just waiting to be found. Time is of the essence though, because these shells can only survive the elements for so long. I have noticed that the specimens found last year were significantly more eroded than those found about twenty years earlier.

1, 2, *Rhytida greenwoodi greenwoodi* (Gray),



15, *Schizoglossa gigantea* Powell, Tahora, Gisborne, subfossil, 32 mm. 16, *S. worthyae* Powell, Mauku, South Auckland, 8–22 mm. 17, *S. novoseelandica* (*Pfeiffer*), near Taihape, North Island, 6–20 mm.

Onepunhi Fossil Beds, Rangitiki River

Michael K. Eagle and Glenys Stace

INTRODUCTION

In February 1996 the authors visited several Pleistocene molluscan sites within the Rangitikei Valley in the hope of recollecting several fossil species including *Anadara trapesium, Paphies pliocenicum* and *Paphies ventricosum.* Although sketchy notes on the paleoecology of these fossil sites have been published (Te Punga 1953), it was thought that much could be learned from further field investigation of them. Expediency nominated the Onepuhi Fossil Beds and immediate surrounding area for fieldwork and a fossil faunal list was produced for comparison with that already published.

PREVIOUS WORK

The geology and stratigraphy of the late Castlecliffian rocks in the Rangitikei Valley have been mapped and/or described by Crawford (1861), Park (1886; 1909a; 1909b; 1916), Cotton (1940; 1944), Te Punga (1953), Beu et al. (1990) and Naish (University of Auckland PhD. thesis, 1996).

Te Punga (1953) recorded 97 molluscan fossil species from four conglomerate and sand/mud beds within the Maxwell Group, Maxwell Formation. Included within these stratigraphic sequences outcropping in the Rangitikei Valley are the Barytellina, Porewa, Shell Creek, Rangitawa, and Onepuhi Fossil Beds.

GEOLOGY

The Rangitikei Valley is composed of soft marine grey silty mudstones and brown sandstones as well as rusty conglomerate units and bands peculiar to the Maxwell Formation. Molluscan fossils at the locality visited appear in-situ and exhibit molluscan taphonomy. Current-bedded shell-grit conglomerate and sands indicate successive transgressive/regressive sequences. The nearby active Onepuhi Fault and successive Rangitikei River fluvial terraces are local Quarternary features of the geological landscape.

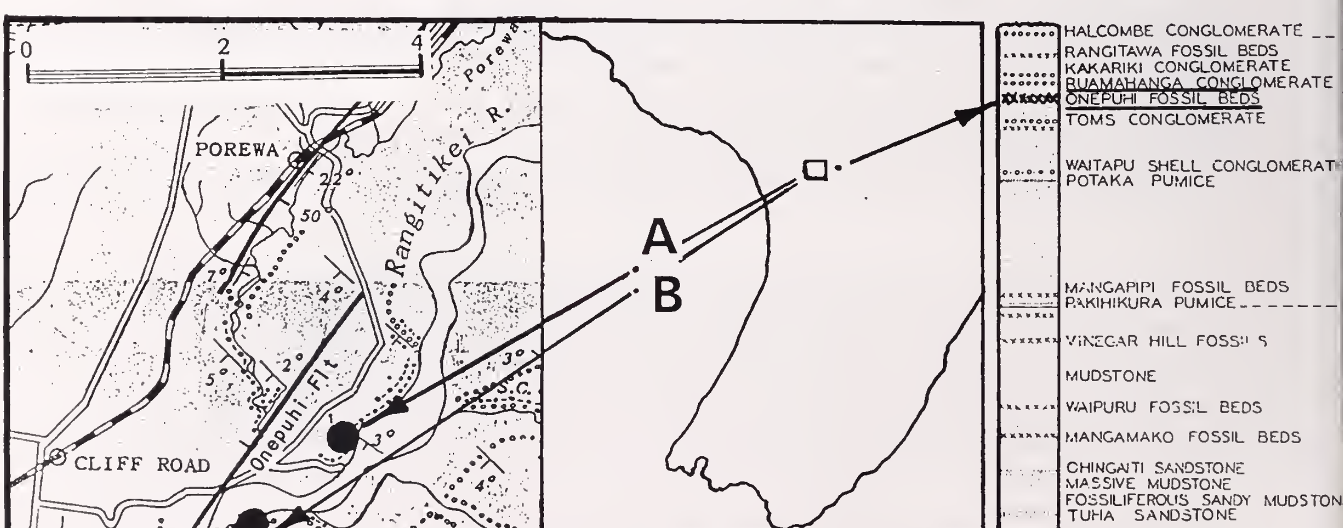


Fig. 1. Geographic and stratigraphic location of the Onepuhi Fossil Beds (A) and (B) Rangitikei River (after Te Punga 1953) .

The Onepuhi Fossil Beds (A) & (B) (Fig. 2, 3) are located on opposite banks of the Rangitikei River (Fig. 1), approximately 5.5 km from State Highway 1 and the township of Porewa. A paleo-rivercutting provides a kilometre long exposure. A low riverbank aides access to the fossiliferous c 40 metre high cliffs sited immeditely behind both sites. Molluscan fossils at both sites are well preserved with only occassional aragonitic delamination or calcium carbonate decomposition.

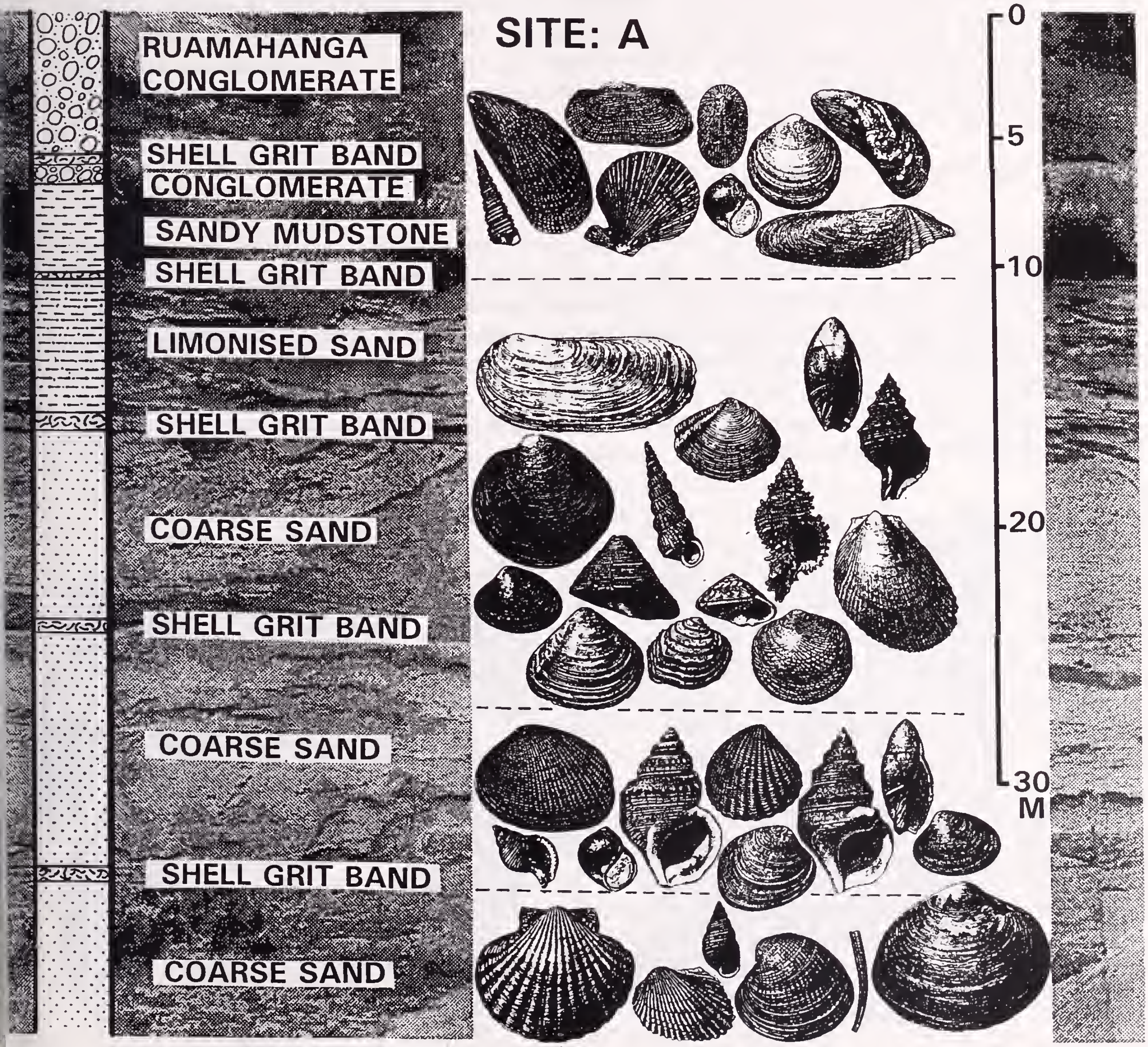


Fig. 2. Onepuhi Fossil Beds site (A) showing stratigraphic column developed from site photograph and representitive molluscan fauna found fossil within each bed (drawings from Beu *et al.*, 1990).

ONEPUPHI FOSSIL BED (A)

Fossiliferous creamy-yellow sandstone outcrops as part of the riverbank cliff cutting (Fig. 2). The first 20 metres from base is current bedded and sparsely fossiliferous (Appendix 1) containing, amongst other fauna, the molluscan bivalves *Myodora striata, Anadara trapezi, Austrovenus stuchburyi, Pecten novaezelandiae, Tawera spissa, Tellinota edgari* and several bands of shell-hash. A sandy-mudstone layer (near the top of site A) containing predominantly *Fellaster zelandica, Offadesma angasi, Pelicaria vermis vermis, Struthiolaria papulosa, Limaria orientalis, Tawera spissa, Zethalia zelandica* and *Dosinia (Austrodosinia) anus* ends at the 20 metre stratigraphic level. A further higher 10 metres of current and cross-bedded sparsely fossiliferous sand contains isolated specimens of *Spisula aequilatera* and *Mactra discors.* At the 30 metre stratigraphic level, cross-bedded limonitised sandstone inclusive of bioturbation grades upward into blue-grey mudstone. The rusty Ruamahanga Conglomerate rests unconformably on top of the sandstone/mudstone sequence and contains sparse fossils at the base. These include *Tugali elegans, Tucitona laticostata, Glycymeris modesta* and *Barbatia novaezelandiae.*

ONEPUPHI FOSSIL BED (B)

Fossiliferous (Appendix 1) blue-grey sandstone occurs at water-level south of the mouth of the Ruamahanga Stream (Fig.3) and contains inner-shelf fauna such as *Panopea wanganuiensis, Patro undatus, Tiostrea chilensis lutaria, Coluzia spiralis, Alcithoe arabica,* and *Astrea heliotrophium.* The sequence grades upwards into laminated silty sandstone and mudstone. Abundant *Maorimactra ordinaria* are found in a 15 cm silty sandstone layer c 7.5 metres above the water. Further laminated beds high in mica grade upwards into current-bedded, yellowish-brown, silty sandstone and pebbly conglomerate. Rusty Rumahanga Conglomerate overlies this poorly consolidated sandstone.

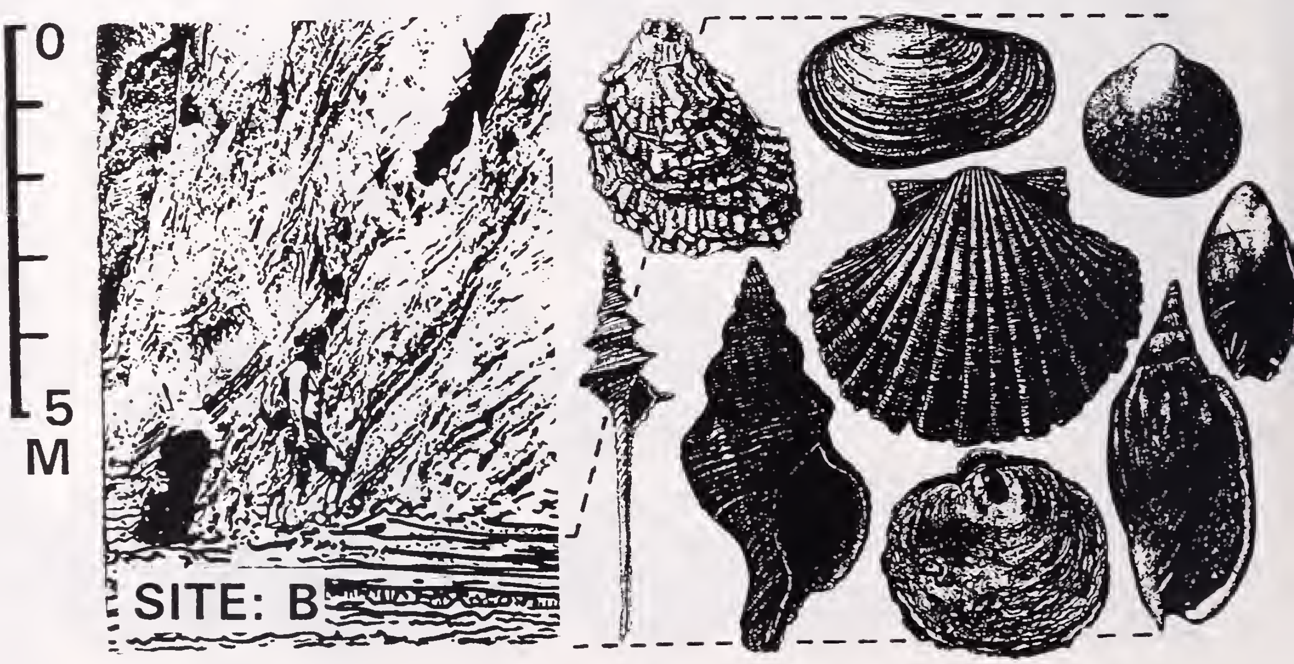


Fig. 3. Onepuhi Fossil Beds site (B) showing river bank and representative fauna found fossil there (molluscs from Beu *et al.*, 1990).

PALEOENVIRONMENT

The Onepuhi Fossil Beds are a low energy, shallow water facies of the Wanganui Series late Castlecliffian geologic stage (oxygen isotope stages 15 to 11). The Onepuhi Fossil Beds consist of 80-250 metres of sand and mud shellbeds formed by the deposition of coarse to fine sediment in a current-swept inner to mid-shelf environment. Regular eustatic changes occur with good time control within this Castlecliffian sequence. Paleobathymetry appears governed by the rate of Wanganui Basin subsidence, and the rate of marine sediment deposition. Basinial subsidence produced a transgressive marine sequence that resulted in shallow, muddy, estuarine biotopes being replaced by variable sandy beach conditions. Both beach sand and varying amounts of mud are sediments indicative of an enclosed bay partially open to the sea. This subtidal biotope progressively developed as a shallow water open sandy beach with a high percentage of broken transported shell. Available sediment and subsequent recruitment contributed to a change from sand to a coarse greywacke-pebble beach with shell-grit, mud and sand typical of an open coastal river-mouth. Glaciations and many climate fluctuations that were a feature of the Pliocene and Pleistocene, inclusive of Castleclifian times, produced faunal changes expected of periods.

PALEOECOLOGY

Morton and Miller (1968) provide an extensive description of the characteristics of various intertidal environments and transects. Sandy beaches lack large attached plants (other than *Zostera)* and support far fewer species than do the intertidal rocky bottom areas or the muddy intertidal substrates that they often imperceptably grade from. Both muddy intertidal and rocky biotopes possess a greater area of heterogeneity than sandy beaches that commonly have a black, reduced layer at depth. Much detrital food is supplied from the sea, sustaining many invertebrates; active predation of them by carnivorous gastropods is ecologically significent as is mortality due to protracted high temperature and dissication.

Chamfered Naticid borings probably made by *Tanea zelandica* or *Uberella* cf. *denticulifera* are evident on many of the bivalve specimens collected. Several semi-infaunal gastropods (eg: *Astrea heliotrophium)* and bivalves (eg: *Tawera spissa)* were infested by the annelid *Polydora.* The borings are usually restricted to the portion of the shell occuring largely above the level of the sediment. Hydroid excavations and clionid sponge borings are found on *Tucetona laticostata* and are similar to those found on the species today, indicating interference with the animal prior to death. Epibiotants found fossil on the Onepuhi molluscan fauna are the bryozoan *Electra pilosa,* the barnacle *Balanus decorus* and the polychaete worm *Pomatoceros caeruleus.*

Longshore currents facilitate larval distribution (Hedgpeth, 1957), consequently there are many vertical biotic zones on a modern beach and shallow subtidal sandy environment. The recognition of paleo-beach intertidal environments depend on various physical and biotic criteria. The criteria recognised at the Onepuhi Fossil Beds include: (a) relatively low taxon diversity and (b) larger species shells in the intertidal than of the same genus in the shallow subtidal. Limonitised calianassid burrows that leave the trace fossil *Ophiomorpha* are evident along with test fragments of *Echinocardium cordatum* and *Fellaster zelandica* at site (A). Deeper water, probably innershelf, is recognised at site (B) where *Panopea wanganuica* and *Coluzea spiralis* were collected.

The shelly debris that exist as periodic stratigraphic bands at site (A) are "biolithic" subdivisions that give some indication as to the dominant shelly benthos occupying different areas of the shelf similtainously or successively. These were used as a preliminary to actual community analysis as well as a useful means of generalisation. Shell hash is comprised essentially of *Austrovenus stutchburyi, Tawera spissa, Dosinia* spp., *Tellina* spp., echinoderm fragments, and bryozoans. Fossil assemblages observed in-situ suggest community faunal associations as detailed in Table 1.

Turbulance is an important factor in the distribution of living marine plants and animals. The correlation between grain-size and fauna indicates that rheology was important at site (A). An excellent example of the casual relationship between coarse sediment characteristic and presence of benthic organisms is *Neothyris ovalis* occurring on a coarse sand and gravelly, tubulent bottom. There is a tendancy for heavier shells to naturally stabilise themselves on/in unconsolidated substrates, particularly with morphological "anchoring" mechanisms such as co-marginal frills (here exemplified on *Bassina yati).* Thin-shelled molluscs also stabilised themslves by exhibiting a taphonomy precluding exhumation from the substrate (as in the tellinids found here) or by living infaunally at depth as did *Panopea wanganuica. Panopea wanganuica* are found at site (B) post-mortem in living position, inundated by sediment indicating an influx of fine sediment which probably "choked" them to death.

The occurrence and shell preservation of *Austrovenus stutchburyi* at site (A) suggests different depositional conditions of the Maxwell Formation. Many are preserved in mudstone with conjoined valves, also indicating a mass mortality at one time caused either by sediment burial or a disease epidemic. *Polydora* borings are often evident on the posterior of both valves.

A total of 69 bivalves, 41 gastropods, 1 scaphopod, 2 barnacles, 2 echinoderms, 2 polychaete worms, 1 brachiopod, 2 bryozoa, and 1 fish scale were identified from the Onepuhi Fossil Beds. Of the bivalves 15% (9) were deposit-feeders and the rest suspension-feeders. Of the gastropods 17% (7) were herbivores, 21% (9) were deposit feeders and 62% (25) were carnivores. The scaphopod and both echinoderms were deposit-feeders and the bryozoans, brachiopod, polychaete worms, barnacles and solitary coral were suspension feeders. The feeding habits of preserved faunal content of both beds was 56% suspension feeders, 17% deposit-feeders, 20% carnivores and 7% herbivores. Of the molluscan fauna the bivalves lived 73% infaunally, 26 % epifaunally (16% byssally attached; 10% surface vagrant) and 1% nestled; the gastropds lived 27% epifaunally and 73% semi-infaunally.

The molluscan collection at both sites adds several new records to that of Te Punga (1953), notably *Xenophora neozelandica, Penion sulcatus, Nucula hartivigana, Nucula nititula, Neilo australis, Limaria orientalis, Limatula maoria* and *Alcithoe (Leporamax) fusus fusus.* Uncollected this fieldtrip, but mentioned in his species list were *Paphies ventricosum, Chemnitzia zelandica, Maoricrypta wilkensi, Semicassis pyrum pyrum, Zeatrophon ambiguous,* and *Zeatrophon bonneti.* Approximately 90% of the fauna in the Onepuni Fossil Beds are extant. A comparison of the faunas from the Rangitikei River Onepuhi Fossil Beds indicates that most are also present in the type section at Castlecliff, Wanganui. This suggests a close paleogeographic and paleoenvironmental relationship between both Castlecliffian marine fossil localities.

TABLE 1. Marine biotopes and faunal associations of the Onepuhi Fossil Beds.

MUDDY SHALLOW INTERTIDAL ENCLOSED BAY (O-5 M)

ASSOCIATION 1
Nucula hartivigana, Nucula nitidula, Cyclomactra rudis, Cyclomactra tristis;
ASSOCIATION 2
Austrovenus stuchburyi, Barytellina crassidens, Anomia triginopsis, Anadara trapezia, Cyclomactra ovata and Paphies australe;
ASSOCIATION 3
Offadesma angasi and *Atrina pectinata, Pecten novaezealandiae, Pecten tainui, Pecten benedictus marwicki, Tenuiaction ambiguous, Antalis nana;*

ASSOCIATION4
Austrovenus stuchburyi, Xymene plebeius, Dosina zealandica.
ASSOCIATION 5
Sigapatella novaezelandiae, Antisolarium egenum, Zethalia zelandica, Fellaniella (Zemysia) zelandica, Fellaniella (Zemysia) ampla, Lasea hinemoa, Arthritica bifurca, Mylliteryx parva, Pleuromeris marshalli, Amalda (Baryspira) australis, Amalda (Baryspira) depressa, and Purpurocardia purpurata;

SANDY ENCLOSED BAY PARTIALLY OPEN TO THE SEA (5-10 m)

ASSOCIATION 6
Maoricolpus roseus, Caryocorbula zealandica, Taniella cf.planisuturalis and Dosinula zealandica, Penion sulcatus;
ASSOCIATION 7
Tawera spissa, Tawera wanganuiensis, Tucetona laticostata, Struthiolaria papulosa, Tellinota edgari, Rexithaerus edgari, Pelicaria vermis vermis, Gari lineolata, Gari (Gobraeus) stangeri, Prototharca crassicosta, Tanea zealandica, Alcithoe (Alcithoe) arabica;
ASSOCIATION
Neilo australis, Ruditapes largillierti, Limaria orientalis, Dosinula zealandica, Porieria zelandica, Duplicaria (Pervicacia) tristis, Maoricolpus roseus;
ASSOCIATION 9
Xymene expansus, Xymene ambiguus.

SANDY OPEN COASTAL SUBTIDAL LITTORAL (10-20 m)

ASSOCIATION 10
Tawera spissa, Bassina yati, Myadora striata, Gari (Gobraeus) stangeri, Amalda (Baryspira) mucronata, Amalda (Gracilispira) novaezelandiae, Murexsul octogonus, Cominella glandiformis, Calliostoma selecta, Zethalia zelandica, Antisolarium egenum, Tanea zealandica;
ASSOCIATION 11
Dosinia (Austrodosinia) anus, Macomona liliana, Divaricella (Divalucina) huttoniana, Sigapatella novaezelandiae, Oxyperas (Pseudoxyperas) elongata, Spisula aequilateralis, Uberella cf. *denticulifera, Fellaster zealandica, Zenatia acinaces, Epitonium jukesianum;*
ASSOCIATION 12
Dosinia (Austrodosinia) anus, Limaria orientalis, Macomona liliana, Stiricolpus vittatus, Austrofusus glans and *Austrofusus chathamensis.*

COARSE-PEBBLE COASTAL RIVERMOUTH SUBTIDAL LITTORAL (10-20 M)

ASSOCIATION 13
Neothyris ovalis, Modiolarca impacta, Modiolus areolatus, Aulacomya ater, Stiricolpus symetricus;
ASSOCIATION 14
Amygdalium striatum, Barbatia novaezealandiae, Chlamys gemmulata, Chlamys zealandiae, Micrelenchus sanguineus sanguineus, Trochus (Thorista) viridis, Tugali pliocenica, Tugali elegans;
ASSOCIATION 15
Tawera spissa, Tawera wanganuiensis, Tanea zealandica, Purpurocardia purpurata, Uberella cf. *denticulifera, Calliostoma punctulatum, Tucetona laticostata, Glycymeris modesta;*
ASSOCIATION 16
Perna canaliculus, Xenostrobus huttoni, Hiatella arctica, Barnea (Anchomasa) similis, Sigapatella novaezelandiae.

SANDY MUDS INNERSHELF (20-50 M)

ASSOCIATION 17
Amalda (Baryspira) mucronata, Gonimyrtea cocinna, Nemocardium (Pratulum) pulchelum, Penion sulculus, Aeneator attenuatus, Aeneater marshalli, Astrea heliotropium;
ASSOCIATION 18
Panopea wanganuica, Patro undatus, Tiostrea chilensis lutaria and *Scalpomactra scalpellum, Coluzea spiralis;*
ASSOCIATION 19
Mesopeplum convexum, Pecten benedictus marwicki,
Alcithoe (Alcithoe) arabica, Alcithoe (Leporemax) fusus fusus, Emarginula striatula.

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APPENDIX I. Systematic list of macrofauna tabulated from the Onepuhi Fossil Bed (A) and (B) localities. Taxonomy follows Beu et al. (1990) for Mollusca; Dawson (1990) for brachiopods; Buckeridge (1983) for barnacles; Squires (1958, 1962) for coelenterates; Fell (1954) for echinoderms and Gordon and Mawatari (1992) for bryozoans.

	MOLLUSCA BIVALVIA	SITE(A)	SITE(B)
NUCULIDAE	*Nucula hartivigana* Dohrn, 1864	X	
	Nucula nitidula A.Adams, 1856	X	
MALLETIIDAE	*Neilo australis* (Quoy & Gaimard, 1835)	X	
ARCIDAE	*Barbatia novaezealandiae* (Smith, 1915)	X	
	Anadara trapezia (Deshayes, 1839)	X	
GLYCYMERIDAE	*Glycymeris (Glycymerula) modesta* (Angus, 1879)	X	
	Tucetona laticostata (Quoy & Gaimard, 1835)	X	
MYTILIDAE	*Aulacomya ater maoriana* (Iredale, 1915)	X	X
	Perna canaliculus (Gmelin, 1791)	X	
	Modiolarca impacta (Herman, 1782)	X	
	Modiolus areolatus (Gould, 1850)	X	
	Amygdalium striatum (Hutton, 1873)	X	
	Xenostobus huttoni (Suter,1914)	X	
PINNIDAE	*Atrina pectinata zelandica* (Gray, 1835)	X	

PECTINIDAE	*Chlamys gemmulata* (Reeve, 1853)	X	
	Chlamys zelandiae (Gray, 1843)	X	
	Mesopeplum convexum (Quoy & Gaimard, 1835)		X
	Pecten novaezelandiae Reeve, 1853	X	
	Pecten benedictus marwicki (Finlay, 1930)	X	X
	Pecten tainui (Finlay, 1930)	X	
ANOMIIDAE	*Anomia trigonopsis* Hutton, 1877	X	
	Patro undatus (Hutton, 1885)		X
LIMIDAE	*Limaria orientalis* (A.Adams & Reeve, 1850)	X	
	Limatula maoria Finlay, 1926	X	
OSTREIDAE	*Tiostrea chilensis lutaria* (Hutton, 1873)		X
LUCINIDAE	*Divaricella (Divalucina) huttoniana* (Vanatta, 1901)	X	
	Gonimyrtea concinna (Hutton, 1885)		X
UNGULINIDAE	*Felaniella (Zemysia) zelandica* (Gray, 1835)	X	
	Felaniella (Zemysia) ampla (Hutton, 1885)	X	
ERYCINIDAE	*Arthritica bifurca* (Webster, 1908)	X	
	Lasaea hinemoa Finlay, 1928	X	
	Mylliteryx parva (Deshayes,1857)	X	
CARDITIDAE	*Pleuromeris marshalli* (Marwick, 1924)	X	
	Venericardia purpurata (Deshayes, 1854)	X	
CARDIIDAE	*Nemocardium (Pratulum) pulchellum* (Gray, 1843)		X
MACTRIDAE	*Cyclomactra rudis* (Hutton, 1873)	X	
	Cyclomactra ovata (Gray, 1843)	X	
	Cyclomactra tristis (Reeve, 1854)	X	
	Mactra discors Gray, 1837	X	
	Maorimactra ordinaria (Smith, 1898)	X	X
	Oxyperas (Pseudoxyperas) elongata (Quoy & Gaimard, 1835)	X	
	Scalpomactra scalpellum (Reeve, 1854)	X	
	Spisula aequilatera (Deshayes in Reeve, 1854)	X	
	Zenatia acinaces (Quoy & Gaimard, 1835)	X	
MESODESMATIDAE	*Paphies australis* (Gmelin, 1791)	X	
	Paphies donacina (Spengler, 1793)	X	
TELLINIDAE	*Barytellina crassidens* Marwick, 1924	X	
	Macomona liliana (Iredale, 1915)	X	
	Tellinota edgari (Iredale, 1915)	X	
	Rexithaerus spenceri (Suter, 1907)	X	
PSAMMOBIIDAE	*Gari lineolata* (Gray, 1835)	X	
	Gari (Gobraeus) stangeri (Gray, 1835)	X	
VENERIDAE	*Dosina zelandica* Gray, 1835	X	
	Austrovenus stutchburyi (Gray in Wood, 1828)	X	
	Bassina yatei (Gray, 1835)	X	
	Protothaca crassicosta (Deshayes, 1835)	X	
	Tawera spissa (Deshayes, 1835)	X	
	Tawera wanganuiensis Marwick, 1927	X	
	Dosinia (Asa) lambata (Gould, 1850)	X	
	Dosinia (Austrodosinia) anus (Phillipi,1848)	X	
	Dosinia (Phacosoma) maoriana Oliver, 1923	X	
	Notocallista (Striacallista) multistriata (Sowerby, 1851)	X	
	Ruditapes largillierti (Philipi, 1847)	X	
CORBULIDAE	*Caryocorbula zelandica* Quoy & Gaimard, 1835	X	
HIATELLIDAE	*Hiatella arctica* (Linnaé, 1767)	X	
	Panopea wanganuica Powell, 1952		X
	Panopea zelandica Quoy & Gaimard, 1835		X
PHOLADIDAE	*Barnea (Anchomasa) similis* (Gray, 1835)	X	
PERIPLOMATIDAE	*Offadesma angasi* (Crosse & Fischer, 1864)	X	
MYOCHAMIDAE	*Myadora striata* (Quoy & Gaimard, 1835)	X	

GASTROPODA

FISSURELLIDAE	*Tugali pliocenica* Finlay, 1926	X	
	Tugali elegans Gray, 1843	X	
	Emarginula striatula Quoy & Gaimard, 1834	X	
TROCHIDAE	*Micrelenchus sanguineus sanguineus* (Gray, 1843)	X	
	Trochus (Thorista) viridis Gmelin, 1791	X	
	Antisolarium egenum (Gould, 1849)	X	
	Zethalia zelandica (Hombron & Jacquinot, 1854)	X	
	Calliostoma selectum (Dillwyn, 1817)	X	
	Calliostoma punctulatum (Martyn, 1784)	X	
TURBINIDAE	*Astrea heliotropium* (Martyn, 1784)		X
TURRITELLIDAE	*Maoricolpus roseus* (Quoy & Gaimardi, 1834)	X	
	Stiricolpus symetricus (Hutton, 1873)	X	
	Stiricolpus vittatus (Hutton, 1873)	X	
STRUTHIOLARIDAE	*Pelicaria vermis vermis* (Martyn, 1784)	X	
	Struthiolaria papulosa (Martyn, 1784)	X	

CALYPTRAEIDAE	*Sigapatella novaezelandiae* (Lesson, 1830)	X	
XENOPHORIDAE	*Xenophora neozelanica* Suter, 1908		X
NATICIDAE	*Proxiuber australe* (Hutton, 1873)	X	
	Tanea zelandica (Quoy & Gaimardi, 1832)	X	
	Taniella cf. *planisuturalis* (Marwick, 1924)	X	
	Uberella cf. *denticulifera* (Marwick, 1924)	X	
EPITONIIDAE	*Epitonium jukesianum* (Forbes, 1852)	X	
BUCCINIDAE	*Aeneator attenuatus* Powell, 1927		X
	Aeneator marshalli marshalli (Murdoch, 1927)		X
	Austrofusus cf. *chathamensis* Finlay, 1928	X	
	Austrofusus glans (Röding, 1798)	X	
	Cominella (Josepha) glandiformis (Reeve, 1847)	X	
	Penion sulcatus (Lamarck, 1816)		X
TURBINELLIDAE	*Coluzea spiralis* (A. Adams, 1856)		X
MURICIDAE	*Murexsul octogonus* (Quoy & Gaimard, 1833)	X	
	Poirieria zelandica (Quoy & Gaimard, 1833)	X	
	Xymene expansus (Hutton, 1833)	X	
	Xymene ambiguus (Philippi, 1854)	X	
	Xymene plebeius plebeius (Hutton, 1873)	X	
OLIVIDAE	*Amalda (Baryspira) australis* (Sowerby, 1830)	X	
	Amalda (Baryspira) depressa (Sowerby, 1859)	X	
	Amalda (Baryspira) mucronata (Sowerby, 1830)	X	X
	Amalda (Gracilispira) novaezelandiae (Sowerby, 1859)	X	
TEREBRIDAE	*Duplicaria (Pervicacia) tristis* (Deshayes, 1859)	X	
VOLUTIDAE	*Alcithoe (Alcithoe) arabica* (Gmelin, 1791)		X
	Alcithoe (Leporemax) fusus fusus (Quoy & Gaimard, 1833)		X
ACTEONIDAE	*Tenuiacteon ambiguus* (Hutton, 1885)	X	
	SCAPHOPODA		
DENTALIIDAE	*Antalis nana* (Hutton, 1873)	X	
	BRYOZOA		
ELECTRIDE	*Electra pilosa* (Linmaeus, 1761)	X	
	BRACHIOPODA		
TEREBRATULIDIA	*Neothyris ovalis* (Hutton)	X	
	POLYCHEATA		
SIPIOIDAE	*Polydora* sp. indet.	X	
SERPULIDAE	*Pomataceros* sp. indet.	X	
	Spirobis sp. indet.	X	
	ECHINOIDEA		
ARACHNOIDIDAE	*Fellaster zealandica* (Gray, 1855)	X	
LOVENIIDAE	*Echinocardium cordatum* (Pennant, 1777)	X	
	CIRRIPEDIA		
BALANIDAE	*Austromegabalanus (Notomegabalanus) decorus argyllensis* Buckeridge, 1983	X	
	COELENTERATA		
FLABELLIDAE	*Monomyces rubrum rubrum* Quoy & Gaimard, 1833)	X	
	TELEOST		
	fish scale gen. & sp.indet.	X	

REMEMBERING SCIENTIFIC NAMES

Part 3: Meanings of Commonly Used Roots

by Frank Boulton

Introduction

In previous articles in this series, we looked at the way, in which the endings of specific names change according to context. One of the things we learned was how the ending of an adjective changes according to the gender of the noun, which it describes. This is why we used to talk about *Maurea punctulata* but the new name of this species is *Calliostoma punctulatum*. The point of learning this was making the species names easier to remember. By learning half a dozen simple rules which cover the majority of cases, we can relieve our memories of the task of remembering the correct ending in every single name.

Now we are going to look at some of the more meaningful elements of names. Linguists often refer to the meaningful units, of which words are made, as *roots*. We can think of these as the part or parts of a word, which come before the changeable ending. Please note that this is not a linguistically rigorous definition. A number of other points below will also lack linguistic rigour. Our task is to make it easier to remember scientific names(not to produce scholars of the classical languages).

Roots

These are the parts of words that carry lexical meaning. We shall adopt the practice of separating roots from each other and from the endings of words with hyphens, e.g. *albo-zonat-us*. When indicating the endings required for the masculine, feminine and neuter genders, it will be noted as follows: *albo-zonat-us, -a, -um*. It is not normal to hyphenate Latin or Greek words like this but it helps to show which part of the word conveys which particular element of meaning.

Compound Words

Many of the specific and generic names used today are compound words, which are formed by running two smaller words together. *Albo-zon-at-us* is a good example of this. The first element is the adjective *albus*, which means *white*. The second part of the word is from the Greek word *zōnē*, which means *belt* or *girdle*. Thus the whole word means having a white belt or stripe around it. You will notice that both of the words, which make up the compound have lost their endings. This is quite normal. An *o* has been inserted between the words. This is just a linking vowel and has no meaning, although it does help to eliminate difficult consonant clusters. This linking vowel is most commonly *o*. There are occasions when it should be an *i*. However, the rules relating to this have been broken so consistently as to

render them not worth remembering. You will also come across names with no linking vowel, e.g. *pauper-eques*(meaning Poor Knights). This usually happens when the first root ends in a vowel or the second root begins with a vowel. A small point worth noting is the ending *-atus* in the word *albozonatus*. This is the equivalent of the ending *-ed* in English adjectives such as bow-legged, flat-footed, etc. So a litteral translation of *albozonatus* would be *white-belted* of *white-banded*. This ending is often found in English words, having been anglicized as *-ate*, e.g. *literate*, *striate*.

Another element worth noting is the prefix *sub-*. This often has its common meaning of *under* or *beneath*. However, it is frequently used to mean *rather*, *a little* or *not quite*. When prefixed to a colour adjective, it is often best translated by the English suffix *-ish*. For example, *roseus* can be translated as *pink* and *subroseus* as *pinkish*.

Notes on the Table

Below is a small table, which gives some commonly used roots and their meanings. It has deliberately kept short, as no one is likely to remember hundreds of new words in one session.

The roots, which we are looking at, are all found in specific names. The following table is concerned only with specific names. Genus names are best dealt with after you have some idea of the meanings of specific names.

The column headed *Root* lists the root that is of primary interest. Adjectives are given in the masculine form followed by the endings for the feminine and the neuter gender and always in that order.

The column headed *Example* lists examples of species name, which contain the root.

The meaning of the entire specific name is given in the column headed *Meaning*. This does not include the genus name.

The column headed *Cognates* lists English words that use the same root. Only words, which are in wide usage, are listed. In many instances, there are no commonly used cognates. These are given to assist in memorizing what the root means. You will find that you already know what a lot of the roots mean. You just do not know that you know them

Root	Example	Meaning	Cognates
alb-us, -a, -um = white	*Hydatina albo-cinct-a* *Cochliolepis albi-cer-at-us* *Taron albo-cost-us* *Trophon albo-labr-at-us* *Lepsiella albo-margin-at-a* *Flammulina albo-zon-at-a*	white-belted white-horned white-ribbed white-lipped white-edged white-belted	albino albumen album(because of its blank pages)
austrāl-is, -is, e = southern	*Amalda austral-is*	southern	Austalia *aurora australis*
benthos = depth	*Alcithoe benthi-col-a*	living in the depths	benthic bathysphere
caelāt-us, -a, -um = engraved, carves	*Micrelenchus cael-at-us*	engraved	
carīna = keel(of a ship)	*Taranis bi-carin-at-a*	twice keeled	careen
costa = rib	*Crepidula cost-at-a* *Protothaca crassi-costa*	ribbed thickly ribbed	
lūte-us, -a, -um = orange,yellow	*Philippia lute-a*	orange/yellow	
macula = spot, stain	*Cominella macul-os-a* *Tonna macul-at-a*	spotty spotted	immaculate
rose-us, -a, -um = rosy, pink	*Maoricolpus rose-us* *Dosinia sub-rose-a* *Phenatoma rose-um* *Splendrillia rosea-cinct-a*	pink pinkish pink pink-belted	rose rosy
sub = rather, a little, -ish	*Dosinia sub-rose-a* *Paphies sub-triangul-at-a*	pinkish rather triangular	subtropical
rūf-us, -a, um = dull yellowish or brownish red	*Micrelenchus rufo-zon-us*	red-banded	William Rufus(because of his red hair)

Field Trip to Tawharanui

Nancy Smith.

On Sunday the 9th of March Cyclone Gavin was heading south after devastating parts of Fiji, whilst Cyclone Justin was whirling down the east coast of Australia. But about a dozen keen folk set off to Tawharanui Regional Park regardless and were rewarded with a brilliant day, warm and sunny but not hot or humid. Some of us lunched under the trees whilst others played on the beach until our Patron Professor John Morton arrived at 1.30 to explore with us the treasures of this beautiful reserve. John was on the parks and planning committees of the old ARA when the park was aquired in 1973.

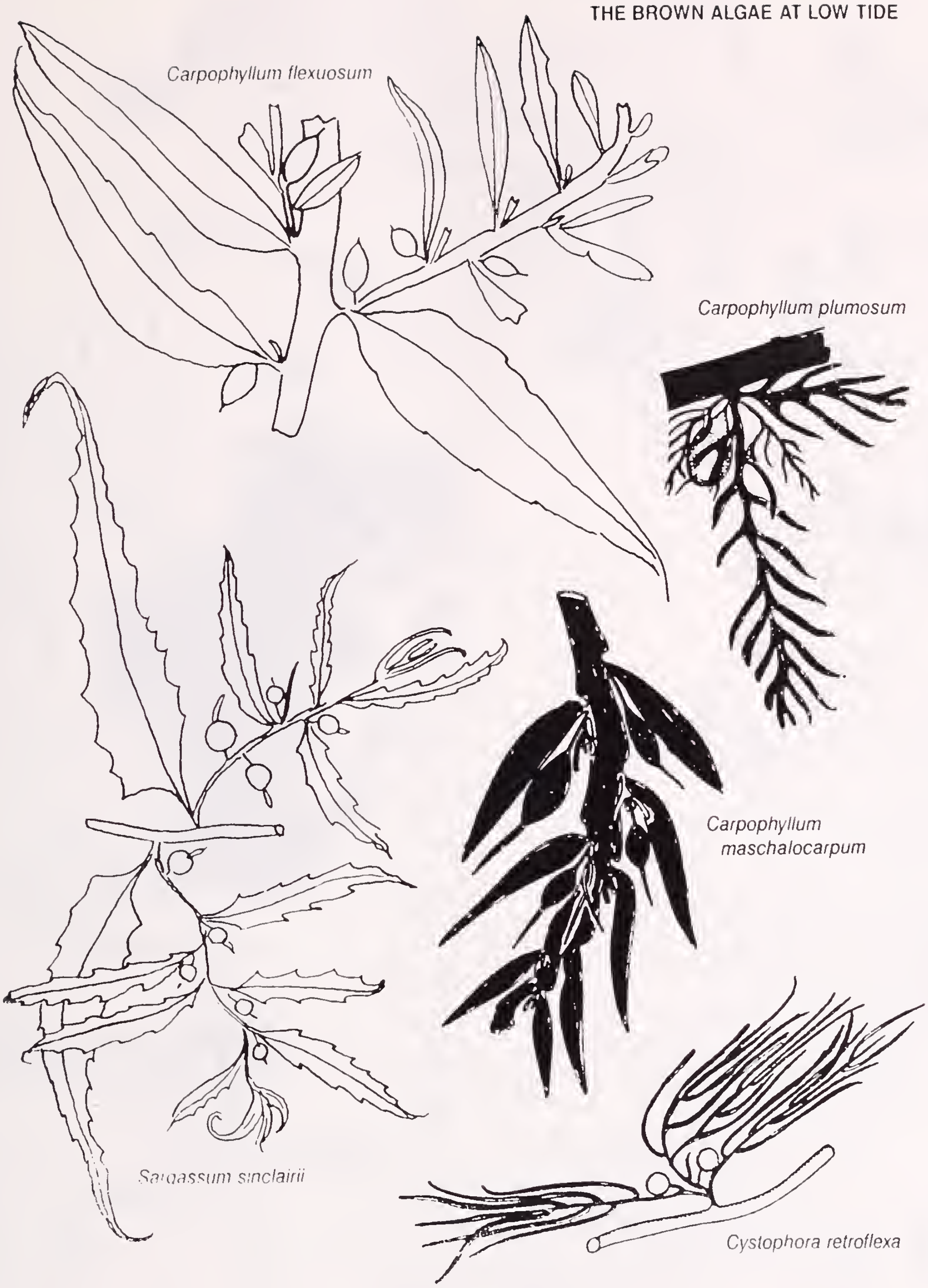
To start he gave us a quick rundown on the geology of the area. Here is one of the outcrops where you can see that the ancient (150 million years) greywacke platform has been overlaid by Miocene sandstone and siltstone. As you walk on the beach past the dune, the coarse pink sand leads into gravel higher up the beach,then rounded cobbles. All represent weathering stages from the greywacke.

The beach had been swept fairly clean by the outgoing tide but a couple of comical northern variable oystercatchers entertained us as they ran into the receeding tide to dig for goodies in the sand then scuttled back up the beach as the next wave flowed in over their feet.

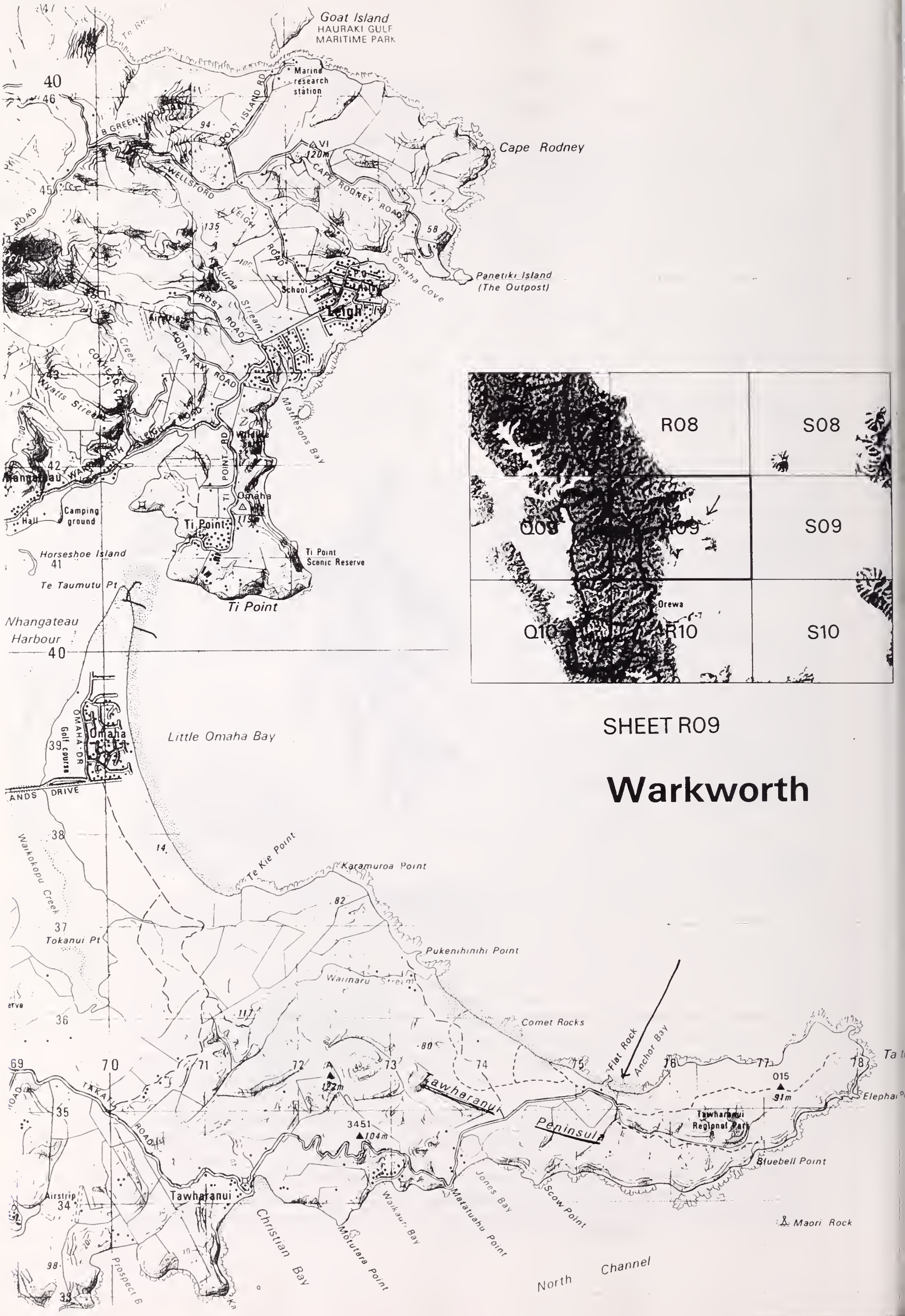
The rocky outcrops at either end of the beach are alive with marine life. Numerous rock pools are well stocked with small kina and several species of seaweeds. On top of the rocks 3 spp. of barnacle , several algae and oysters each fill their niche. This oyster is probably the now less than common Auckland rock oyster *Crassostrea glomerata* (now called *Saccostrea cucullata* Born,1778) which is rapidly being squeezed out by the immigrant *Crassostrea gigas*.. The barnacles look like small medium and large till John points out the signs that identify them into the 3 different species (*Chamaesipho columna, C. brunnea* and *Epopella plicata*). Below the barnacles minute blue spots are the perewinkle (*Littorina antipodum*). This diversity suggests a healthy environment where more than just the hardiest are thriving.

Under the rocks and in the crevices, the mollucs come into view. The nerites (*Nerita atramentosa*) are small, round glossy and black. Look more closely and some are dark navy blue top shells (*Diloma zealandica*). A closer look again reveals a pattern of lines which indicate another top shell (*Melagraphia aethiops*). These shells are all easier to identify when they are somewhat bigger.Amongst the scuttling crabs and colourful sponges live *Thais orbita, Haustrum haustorium*, big *Turbo smaragdus, Notoacmea,* several species of chitons, pretty *Chlamys zelandiae*. Although the chitons appear to be stuck to the rocks, some species found under rocks like *Ischnochiton,* slither away surprisingly fast or curl up and drop off when revealed. These species have numerous light sensitive shell eyes which are sometimes eroded.

John pointed out to us the zonation of the life on the slope of the area. On top of the cliff the old pohutakawas twist their roots down through the crevices. Next highest up live the flora and fauna that need only spray drift to survive, " The sun-warmed rocks carry lichens; first grey-green tufts, then yellow and lowest down black.Never seen on soft papa rock, lichens are one of the oldest most primitive life forms known. Then come small molluscs, barnacles, *Apophloea* - a red-brown alga like a hard crust of congealed blood. Lower down occasional immersion is required. *Corallina officinalis* first produces an algal turf, then continues as a pink paint on the rocks right down to below water level. At the bottom only rare short periods above the water can be survived. Here the large brown seaweeds, chiefly *Carpophyllum maschalocarpum*, and the small kelp *Ecklonia radiata*, are found out of the water only at low spring tides.

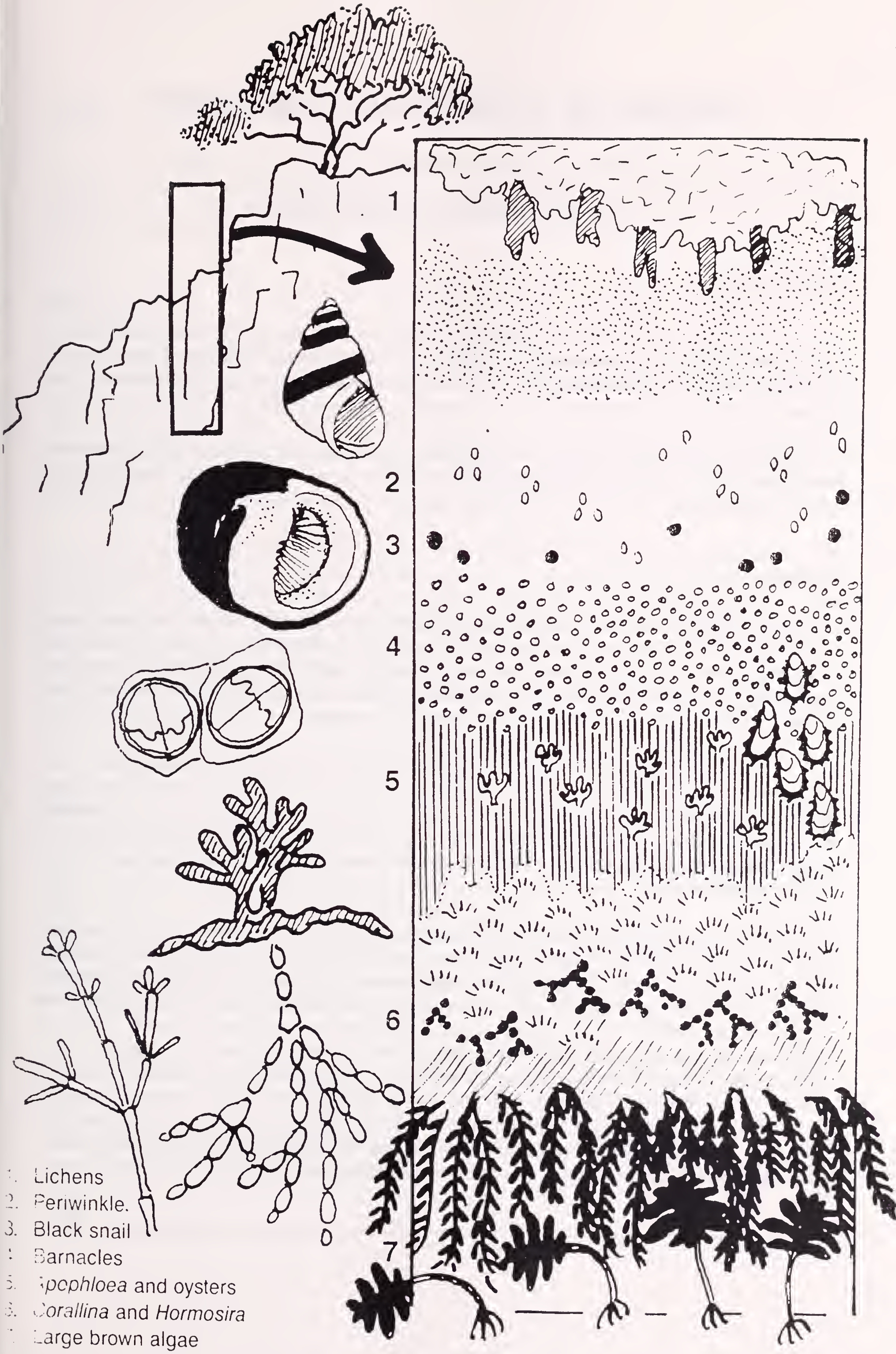


As we wandered home along the beach, flocks of white fronted terns lifted unwillingly out of our way and drifted in behind us to finish their siesta. Folk picked up shells from the drift line; red or orange fan shells (*Chlamys*), the little wheel shell (*Zethalia= Umbonium)* that lives in squadrons in the clean sand off shore, the tiny paua (*Haliotis virginea*) exquisite as a jewel box" The ARA handout says "If you truly covet these shells, pick up a few.But please leave some for others to enjoy. Remember you are now in the boundaries of a marine park."



SHEET R09

Warkworth



1. Lichens
2. Periwinkle.
3. Black snail
4. Barnacles
5. *Apophloea* and oysters
6. *Corallina* and *Hormosira*
7. Large brown algae

Setting up a Saltwater Aquarium

by

Frank Boulton and Phil Taylor

Introduction

Early this year(1997) we decided that we would both set up a saltwater aquarium to keep New Zealand marine species in. Within a couple of months, the results have been so rewarding that we thought readers of *Poirieria* would like to share our experiences. This article is aimed at the beginner.

Being able to observe live animals in your own home is far more exiting than all of the shells that we have filed away in drawers or boxes. If there are children in the household, they will be delighted with a saltwater aquarium.

Equipment

If you go to a pet shop, or even worse a specialist in aquatics, you will be quoted some very high prices for the equipment, which they hope to sell to you. Moreover, they will probably not be able to advise you about this specialised and little explored field. Of course, you can spend thousands of dollars on a project like this but you do not have to. You will need an aquarium, an under-gravel filter, a pump and an air stone.

You only need a small tank. One that is one cubic foot in size is quite adequate. You can invest in something a little larger if you like. A tank with four clear sides is better than one with a coloured or textured rear pane, as it will give you an all-round view. Make sure that your tank is clean and waterproof. This is especially important if you have acquired it from a second-hand shop. Sea salt can be used to clean the tank. Install the under-gravel filter, the pump and the air stone.

There are a few other pieces of equipment, which are not essential but can be very useful. Remember that sea water is highly corrosive. If water splashes out of your aquarium, it may pay to buy a sheet of glass to place over the top of it. A small fishing net of the kind sold in pet shops or aquatic specialist can be very useful for removing uneaten food or dead animals from the tank. It is also useful if you want to remove an animal for some reason. A pair of long tweezers are very useful for feeding animals such as sea anemones. You can easily make a pair of them by taking a pair of chopsticks, or two pieces of thin bamboo or cane that you have split in half. Tape them with heavy-duty adhesive tape at one end and then slip a small piece of wood or bamboo between them just below the tape, so as to force the untapered end open. Applying slight pressure just below the small wooden wedge will close the pincers. Alternatively, you can use a pair of bamboo tongs which can be bought at an Asian grocer's shop.

Sand

You are now ready to put the substrate into your tank. Sand is not the most ideal thing for this. You need something a little coarser. We have found that shell sand is quite good for this. Or you can use gravel such as the kind that you can buy in pet shops. A layer 1½" to 2" thick is adequate.

Rocks

You will need to gather a few rocks to place in your aquarium. It is worth taking a little time and effort over this. Their function is not purely aesthetic. They have to provide your animals with a suitable environment. Rocks with rock-borer holes in them are good to have. Sea anemones tend to move around until they find a safe and comfortable home in one of the holes and other animals use them as hiding places. Soft mudstones are most likely to contain rock-borer holes and can also be used by other boring animal. Rocks with pieces of suitable seaweed growing from them are also very useful.

Arranging your rocks in the aquarium is as important as choosing suitable ones. You should arrange your rocks so that they provide crevices and underhangs for your animals to rest or hide in. Arrange them so that there are plenty of rock-borer holes facing upwards. Place larger rocks at the rear of the tank and smaller ones in front of them. This means that shy, retiring creatures such as the snapping shrimp(*Alpheus socialis*) can make a burrow at the back of the tank. This is why you need clear glass all round. You can place the aquarium with the rear pane to a wall but leave a three or four inch gap. You can now observe what happens in the most secluded area of the aquarium by using a small mirror. A shaving mirror is ideal for this, as it has a normal mirror and a magnifying mirror.

Water

This is obviously very important. Pet shop dealers and aquatics specialists will tell you that it is safer to use the salt that they sell and dissolve it in tap water. What they mean by *safer* is that you stand less chance of introducing foreign organisms, which may harm your animals, into your aquarium. This is true. However, you will be populating your aquarium with animals and plants that may well bring other organisms with them. You also need to create as natural an environment as possible for your specimens. You actually need to have things like microscopic algae, detritus and plankton.

Ordinary sea water can be used. Avoid taking it from polluted areas and do not take it from localities which are likely to have unpredictably high or low salinity. This means avoiding estuarine areas and rock pools.

Every week you should change at least 10% of the water in your aquarium. This is to ensure that waste products do not build up excessively. You will find that you can get away

without changing the water for a couple of weeks. You should replace the water that you remove from the tank with exactly the same amount of seawater. If you notice an appreciable loss of water through evaporation, then you should replace the loss with tap water. The use of seawater to do this will eventually lead to the salinity rising dangerously high.

Populating Your Aquarium

What should you put in the aquarium? The broad answer is anything that you like. There are some guidelines, which can help you avoid undue disappointment. The greatest joy of having a saltwater aquarium is what you learn from it. Experimentation is the main point of the exercise but a few simple guidelines can make it easier for the beginner.

You will need to find suitable animals and plants. Generally speaking, you will find that the inhabitants of high rock pools will adapt quite well to living in an aquarium. They tend to be very tolerant of difficult conditions. High rock pools are cut off from the sea for much longer periods of time than those lower down on the shore. This means that the salinity of the water varies greatly, by water evaporating on hot sunny days and by run-off from the dry land on rainy days. The temperature in high rock pools tends towards greater extremes than the main body of the sea. Oxygen levels are also likely to sink lower in the high rock pools than in those lower down the beach.

When you collect seaweed, it is best to use the green seaweeds. Red and brown seaweeds are best avoided. Take pieces of seaweed that are attached to a small rock or some other substrate or that at least still have their holdfast. The main exception to this rule is *Enteromorpha intestinalis*, which grows attached to a substrate or freely floating. Either way it lasts well in an aquarium.

You will need to take some care about the animals, which you introduce into your aquarium. You can introduce carnivores and scavengers as soon as you have set up your aquarium. Some filter feeders can also be introduced at this stage such as the small black mussel(*Xenostrobus pulex*). Algal grazers will not have a very good chance of survival at this stage. You should wait for three or four weeks before introducing cat's eye snails(*Turbo smaragdus*), the black nerita(*Nerita atramentosa*) and other algal grazers. If you notice an algal bloom developing on the glass before then, you can start to introduce a few grazers.

Beginners would do best to avoid introducing the following into their aquariums:-

limpets
chitons
nudibranchs(or sea-slugs)
red or brown seaweeds
sponges
algal grazing gastropods(for the first couple of weeks)
bivalves(with the exception of *Xenostrobus pulex* and cockles)

So what can you put into the aquarium? Easy things to start off with are the red-

mouthed whelk(*Cominella virgata*), the speckled whelk(*Cominella adspersa*) and the mud whelk(*Cominella glandiformis*). The small black mussel(*Xenostrobus pulex*) can also be introduced right at the start. After a few weeks the black nerita(*Nerita atramentosa*) and the cat's eye snail(*Turbo smaragdus*) can also be introduced. Good descriptions of these are readily available in any of the little pocket books on New Zealand shells. So, we shall not describe them here. Instead, we shall turn our attention to three non-molluscan species, which will make you aquarium more interesting and attractive, while at the same time helping to create a suitable environment for your molluscs to live in. These are the green seaweed *Enteromorpha intestinalis*, the olive-green sea anemone(*Isactinia olivacea*) and the common prawn(*Palaemon affinis*). Descriptions of these organisms are not so easily found especially for the beginner.

Enteromorpha intestinalis

This is a common seaweed. We are unaware of any common name for it. *Enteromorpha* is Greek for *looking like intestines* and *intestinalis* means the same in Latin. We would suggest that *gut weed* would make a descriptive common name.

The plant can grow up to 20cm in length but is usually much shorter. It has no basal branching. The leaves are long and slender, often with gas-filled bubbles in them. The plant attaches itself to the substrate by small rhizoids but is also found freely floating. The colour varies from lime green to emerald green. The plant is soft to the touch.

It can be found growing in upper rock pools. It is often found by the outlets of storm water drains.

When collecting the plant from a substrate, use a robust knife and try to slice slightly into the substrate. This is not too difficult to do if it is on a soft rock such as mudstone or siltstone and it avoids causing too much damage to the holdfast. Place the plants into a suitable container with some water over them to avoid desiccation.

Figure 1 *Enteromorpha intestinalis*

When you arrive home, put your plants into you aquarium. If you have managed to collect them with their holdfast, can arrange them into small bunches, which can the be wedged between a rock and the gravel at the bottom of the tank or they can be secured into a hole in one of the rocks. Do not worry if you have some of the weed floating freely on the surface. The plant will remain fresh for a month or more. A number of animals will graze off it and the chances are that it will be eaten before it goes off.

The Olive-green Sea Anemone(*Isactinia olivacea*)

You can experiment with sea anemones right from the start. We have decided to describe the capture and cultivation of the olive-green sea anemone(*Isactinia olivacea*), because it is common and easy to identify. Apart from the description, these notes apply quite well to other common sea anemones.

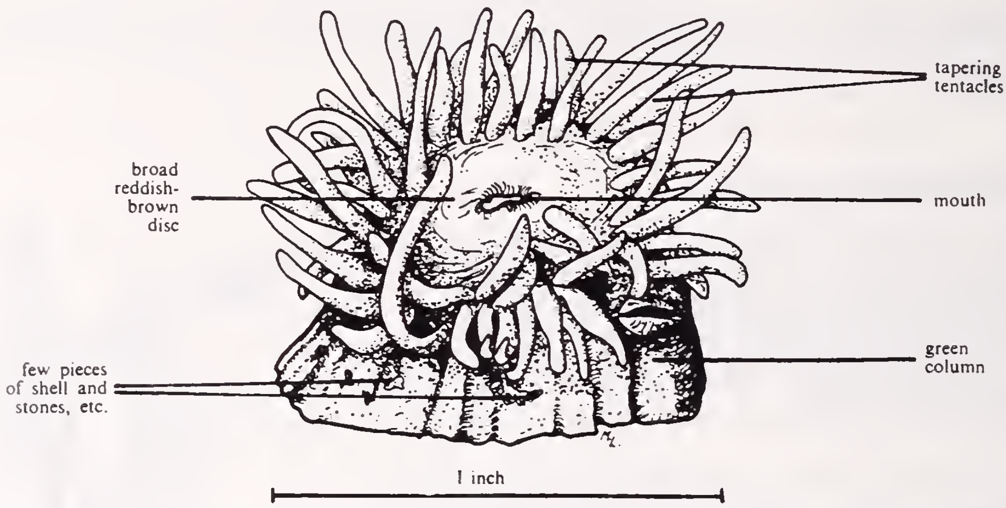


Figure 2 The olive-green sea amenone(*Isactinia olivacea*)

Large specimens of the olive-green sea anemone(*Isactinia olivacea*) can be up to 1½ inches in height and 1 inch across. The column usually has a dull olive-green colour and is fairly smooth. The disc and tentacles are usually green but may be brown. The tentacles are arranged in four or five circles.

This anemone may be found in rock pools and it adheres firmly to a substrate. Select specimens on a flat rock, rather than ones nestling in small holes, as these will be the easiest ones to remove. You will need a sharp, robust knife to remove them. Try to do them as little damage as possible in removing them. If they are on soft rock such as sandstone, mudstone or siltstone, try to slice into the substrate. This may take some time but it is worth the effort to obtain a perfect specimen. If you damage one of them while removing it, take it home with you. Sea anemones have remarkable powers of recovery. Put your anemones into a separate container with some seawater in it. This is to ensure that the do not sting any of your other animals. The stinging cells of New Zealand anemones are not powerful enough to inflict a sting on humans.

When you arrive home, place you anemones into the aquarium. They need to be on rock and the best places for them are old rock-borer holes(so long as they are not too deep) and other little hollows. They will soon attach themselves to the substrate. Some of them will not like the position that you have chosen for them and will wander off in search of a better location.

You can feed anemones with small pieces of raw fish or raw meat. They will need to be fed once or twice a week. Use your long tweezers to place the food in their tentacles. If you have the common prawn (*Palaemon affinis*) in your aquarium, you may have to use the tweezers to fend them off, while your anemones start to ingest their food.

The Common Prawn(*Palaemon affinis*)

The common prawn (*Palaemon affinis*) is a very good animal to have in your aquarium, even though you will probably develop a love-hate relationship with it.

The common prawn attains a length of 2½ inches. Its whole body is so transparent as to make it very difficult to spot in a rock pool. There a lines of green chromatophores along the sides of its body. It has orange stripes on its legs and you may also be able to see smaller black stripes on its legs. They are to be found mainly in rock pools, especially in those higher up on the shore.

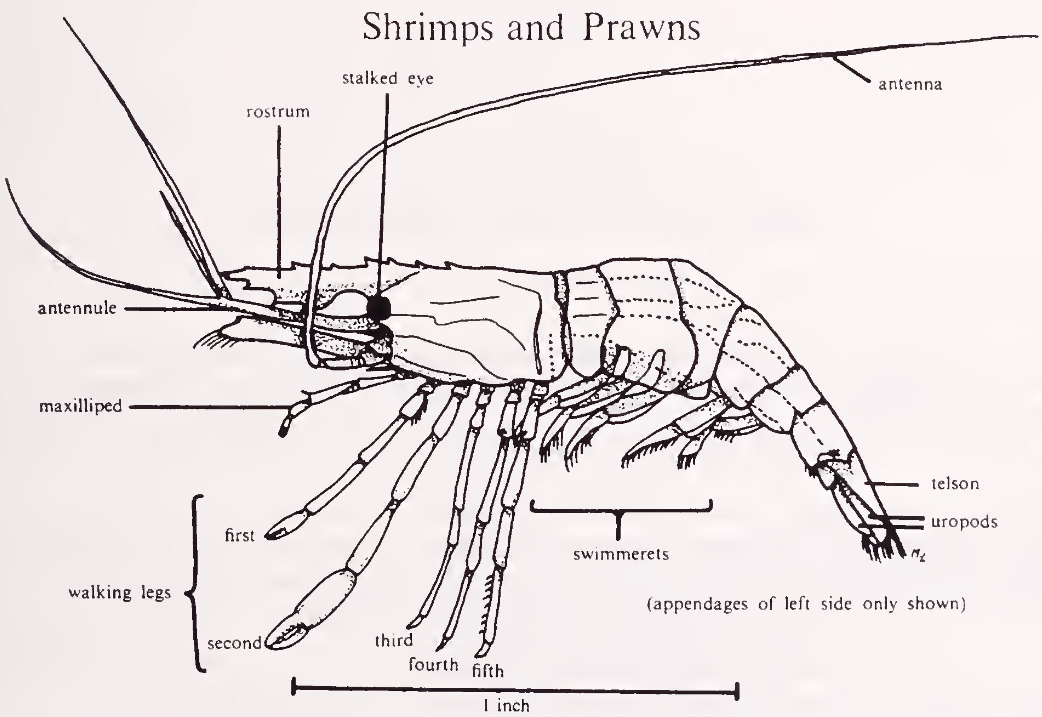


Figure 3 The common prawn(*Palaemon affinis*)

These animals are difficult to spot and to catch. You will probably need to use one of the little nets used for removing fish from aquariums. The common prawn is a good jumper. So, you will have to transfer them from the net to your collecing container very quickly and carefully. You may need to cover your catch with your free hand, while taking it back to the collecting container. The container should be quite deep to prevent escapes. It also helps to

put water into the container, as this will also make it more difficult for them to jump out.

Once home, you can release the prawns into your aquarium. They will take goldfish food, raw fish and raw meat. They will graze on the seaweed *Enteromorpha intestinalis*. Be careful not to overfeed them or else the uneaten food will cause a build up of bacteria in the tank and this could harm the other animals in it. You will also notice that the prawns graze food particles from the glass and rocks and off other animals. If something dies in the tank, they will quickly dispose of it. It is for this reason that they are such useful animals in a saltwater aquarium. They help to maintain a healthy environment for all of your other animals. The only trouble is that they will try to steal food off other animals, such as sea anemones. They will do this with infuriating persistence.

The common prawn is a very easy animal to keep in an aquarium. Out of twenty odd specimens we have had not a single loss in over two months. You will find being able to observe their behaviour at close quarters very rewarding.

PERIODICALS:-from Nancy Smith

BASTERIA Vol.60 No.1-3, p1-84
Vol.60 No.4-6, p85-202
Articles by van Aartsen, Boer, Neckheim, Gittenberger, von Proschwitz, Visser et al, Bodon et al, Dijkstra, van der Linden, Vermeulen, Gittenberger, van der Burg & Janssen, and more.
These include nomenclatural notes on *Tubo aculeatus* & *Crassopleura maravignae;*
A *Turanena* species (Bulinimidae) new to science;
A dead damaged shell of *Ranella olearia* is found on the beach of a Dutch island.
Hygromia cinctella (Helicidae) is found in a park in Amsterdam
2 new Hydrobiids, are named, and two new Scacchia (Bivalvia, Lassaeidae)
Some results from a study of Pyramidulidae in Europe.
Notes on the 'Range of *Strombus plicatus pulchellus;*
Part 2 of Djikstras "Notes on taxonomy and nomenclature of Pectinidae.
Several articles on gastropods of the Pyramidellacea.
Notes on:- The non-marine molluscs of the Island of Borneo 7 & 8.
Terresrial molluscs of the island of Sulawesi.
More on the identity of the coloured fossil Pecten found in Netherlands.
A new species of Acteonidae and remarks on other sp. in the Mediterranean.
Most are articles in English and well illustrated.

GLORIA MARIS Vol.35 parts 1-2 including the Index for Vol.30-34, 1991-1995.
This volume contains many photographs from the Belgian society's sixth international shellshow and adverts for the next (7th) show.
The centre colour plates are of *Latirus spp*.
A new species of Hydatina is described by A.Delsaerdt; *Hydatina montillai* from the Philippines.
A note on the identifications of Haliotidae in Gloria Maris Vol.34.

An interesting note on authorship. A recent review of the genus Nerita in Gloria Maris was attributed to "Xenophora" which is the name of the study group of the Belgian Society for Conchology. But international codes require the name(s) of the author as essential if the work is not to be listed as anonymous. Therefore the eight members of the group should be cited as authors! Fortunately Krijnen et al will suffice if referring to the paper.

GLORIA MARIS Vol.35 part 3. 1996

This issue is devoted to "Neritoidea of the Solomon Islands" It is in two parts; this one, marine species. Part two will be non-marine species.

Members of the AMCS will no doubt remember that our Life member Norman Gardner travelled and collected with Mr Delsaerdt in the Solomons on several occassions. Some of us who have been there have had help from Norm with identifying our shells, particulaly the many unusual fresh water neritidae.

On The “Net”

by Glenys Stace

Are you on the Internet? A question more and more frequently asked these days. Some of our members are beginning to use the Internet and one or two are totally hooked! Poirieria doesn’t have a Web site yet, but we would like to keep members up to date with what is available through the Internet.

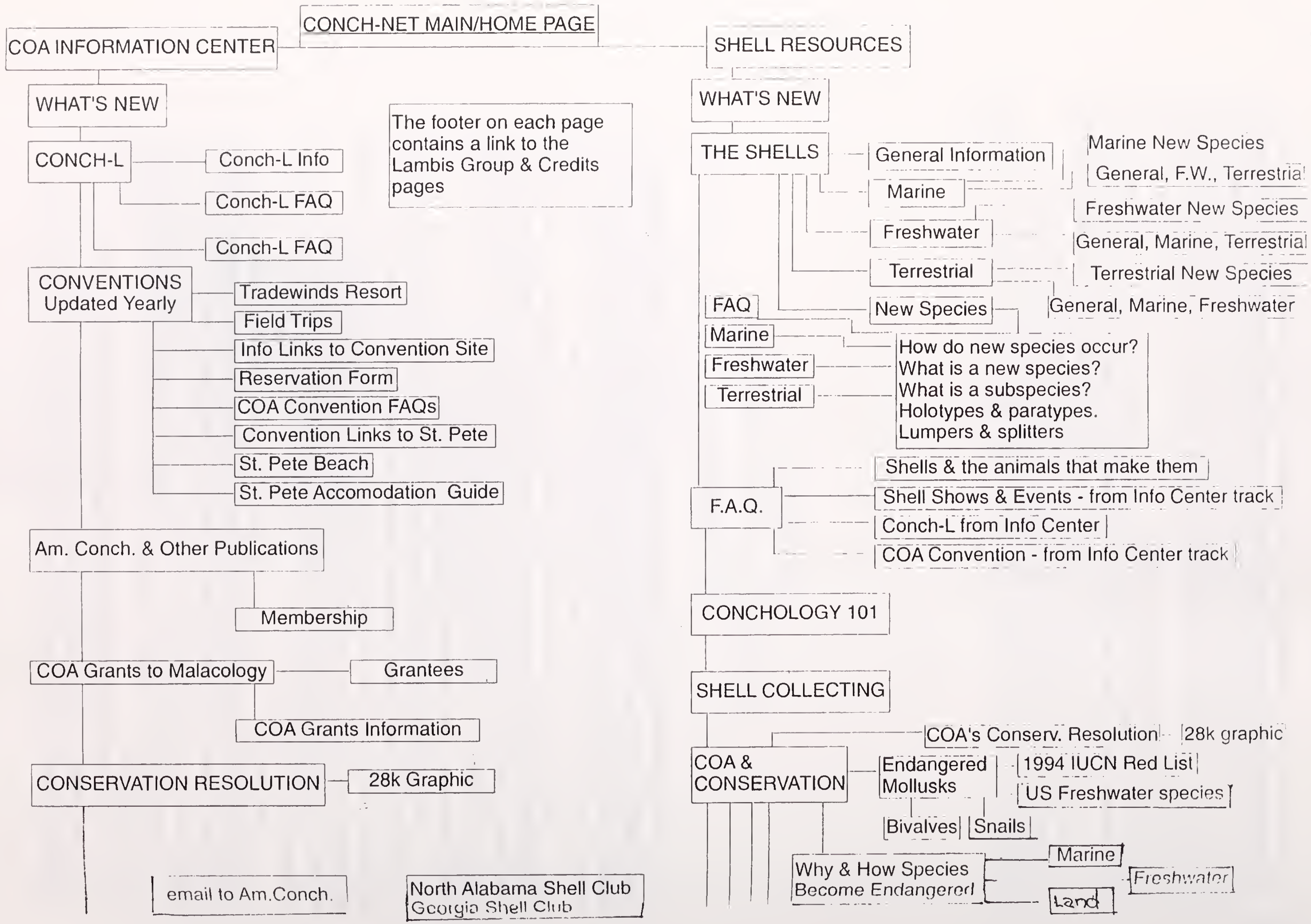
There are at least three sites that you should try out. Conchologist of America has published a huge Internet site named “Conch-net”. The site is complex, but we have been given a flow chart, a handout at the last COA convention, to help you find your way around it. The address of the main/home page is **http//coa.acnatsci.org/conchnet/.** Have fun, it will take you hours.

You could also try Conch-L, a very useful “E-mail P.O.box and mailing list” for conchologists and anyone interested in molluscs. It provides a forum to correspond, ask questions and generally relate and inform on any topic related to shells including some kind of non-profit personal little ads. Any E-mail customer can subscribe for free and all items are available to all subscribers. Address is **listserv@uga.cc.uga.edu.**

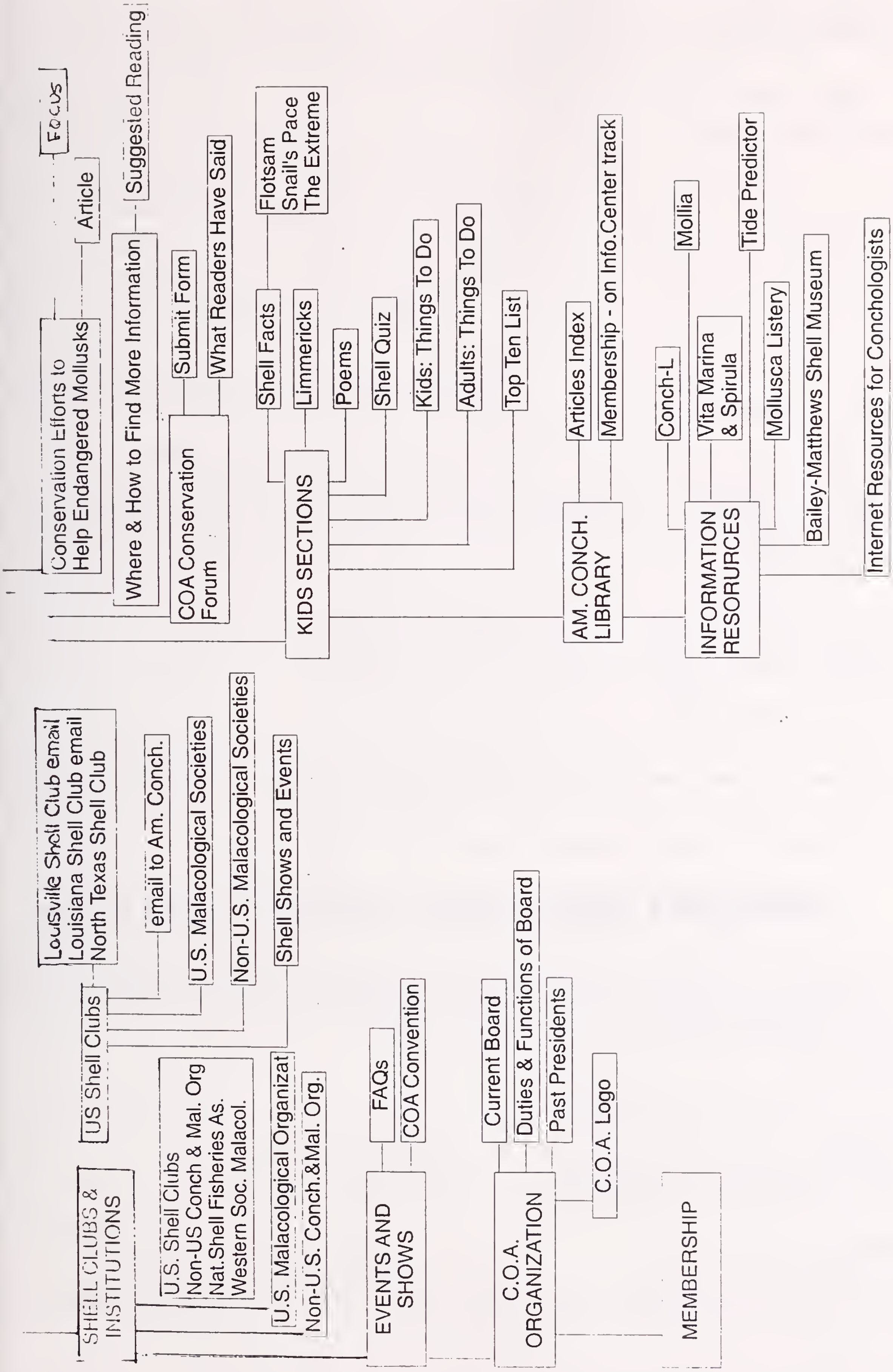
“La Conchiglia” now has a home page. They plan to publish a list of all new species published in the magazine over the years, a general list of all species cited in the magazine since 1969 and information about the magazine. Their site is **http//www.conch.pronet.it,**

Try a search of “conchology” through Yahoo. You might be surprised at how much you will find.

As information circulated on the Internet is in the public domain, we can publish anything you might find there that you think would be of interest to our subscribers. Please send us a printed copy. Maybe we will have a Web site one day.



CONCH-NET MAIN/HOME PAGE
COA INFORMATION CENTER
WHAT'S NEW
CONCH-L
Conch-L Info
Conch-L FAQ
Conch-L FAQ
The footer on each page contains a link to the Lambis Group & Credits pages
CONVENTIONS Updated Yearly
Tradewinds Resort
Field Trips
Info Links to Convention Site
Reservation Form
COA Convention FAQs
Convention Links to St. Pete
St. Pete Beach
St. Pete Accomodation Guide
Am. Conch. & Other Publications
Membership
COA Grants to Malacology
Grantees
COA Grants Information
CONSERVATION RESOLUTION
28k Graphic
email to Am.Conch.
North Alabama Shell Club
Georgia Shell Club
SHELL RESOURCES
WHAT'S NEW
THE SHELLS
General Information
Marine
Freshwater
Terrestrial
New Species
Marine New Species
General, F.W., Terrestrial
Freshwater New Species
General, Marine, Terrestrial
Terrestrial New Species
General, Marine, Freshwater
FAQ
Marine
Freshwater
Terrestrial
How do new species occur?
What is a new species?
What is a subspecies?
Holotypes & paratypes.
Lumpers & splitters
F.A.Q.
Shells & the animals that make them
Shell Shows & Events - from Info Center track
Conch-L from Info Center
COA Convention - from Info Center track
CONCHOLOGY 101
SHELL COLLECTING
COA & CONSERVATION
COA's Conserv. Resolution
28k graphic
Endangered Mollusks
1994 IUCN Red List
US Freshwater species
Bivalves
Snails
Why & How Species Become Endangered
Marine
Freshwater
Land


SHELL CLUBS & INSTITUTIONS
U.S. Shell Clubs
Non-US Conch & Mal. Org
Nat.Shell Fisheries As.
Western Soc. Malacol.
U.S. Malacological Organizat
Non-U.S. Conch.&Mal. Org.
US Shell Clubs
Lousville Shell Club email
Louisiana Shell Club email
North Texas Shell Club
email to Am. Conch.
U.S. Malacological Societies
Non-U.S. Malacological Societies
Shell Shows and Events
EVENTS AND SHOWS
FAQs
COA Convention
C.O.A. ORGANIZATION
Current Board
Duties & Functions of Board
Past Presidents
C.O.A. Logo
MEMBERSHIP
Conservation Efforts to Help Endangered Mollusks
Article
Focus
Where & How to Find More Information
Suggested Reading
COA Conservation Forum
Submit Form
What Readers Have Said
KIDS SECTIONS
Shell Facts
Flotsam
Snail's Pace
The Extreme
Limmericks
Poems
Shell Quiz
Kids: Things To Do
Adults: Things To Do
Top Ten List
AM. CONCH. LIBRARY
Articles Index
Membership - on Info.Center track
INFORMATION RESORURCES
Conch-L
Mollia
Vita Marina & Spirula
Tide Predictor
Mollusca Listery
Bailey-Matthews Shell Museum
Internet Resources for Conchologists

VITA MARINA & SPIRULA "HOME PAGE"

http://www. home.pi.net/~spirula

The home page of Vita Marina & Spirula on the Web is a useful and well-designed site, full of interesting data, news, and links to other sites dealing - even only marginally - with malacological matters. The page begins with a description of the two well-known Dutch magazines (the former, we are reminded, is a marine biology magazine dedicated to mollusks, while the latter is a quarterly newsletter containing items such as travel stories in tropical seas, reviews, educational items, and advertisements). You can follow the links and read a summary of their contents, send a message to the authors, or subscribe on-line. The site allows on-line access to the magazine's directory of shell shows, meetings, and conventions; these are kept up-to-date by summarizing data from all the magazines in the field. Another interesting option is the Directory of Cyber Conchologists and Malacologists; this includes over 330 addresses of people interested in malacology, complete with their e-mail addresses and specific interests. The directory also includes addresses of the major international malacological book dealers as well as a list of tour operators offering shell trips. Pages dedicated to recently described species (from 1993 to date) are very interesting in their arrangement by year described and then by family, in alphabetical order for each year. There follows a huge section of links to other Web sites that have to do with mollusks, complete with a list of servers which are accessible from the page. To add a link to your own page you can e-ma **spirula@pi.net.**
The site is completed with Malacological Art Gallery by o bright friend Leo Man in 't Vel a well-known biologist ar painter, curator of the tropic mollusks section in the Natur Sciences Museum of Rotterda as well as illustrator and collabo ator of Spirula. The site repr duces several works of the artis There are direct links to Web sit dealing with underwater matte on-line access to CONCH-L, t famous listserver Conchologists of America, well as a page for subscribing SPIRULA/VITA MARINA whi also provides information abo their other publications. Ma parts of the site are interacti Our highest compliments to o friend, webmaster J.P. Buijs, f the high quality of this site whi has already been visited by mo than 5000 users in less than year.

INTERNET WEB PAGES ABOUT MOLLUSKS

As promised in the last issue, we begin here a listing of Web pages and sites either about mollusks in general or about specific classes or families. short notes will indicate that the contents go from taxonomy to directories, and from scientific to popular or even commercial. Have fun! And in c you find more sites, please, e-mail them to us!
The next issue will follow with many more items.

-Abalone Distribution
http://www.uct.ac.za/depts/zoology/abnet/species.html
This web site consist of a clickable map with the geographic distribution of all the Abalone species.

-Biosis - Journals
http://www.york.biosis.org/zrdocs/desktop/journals.htm
Biosis is an Internet list of all the zoological journals and magazines.

-Cephalopod Page
http://www.vol.it/mirror/cefalopodi/www.html
This site contains an introduction to Cephalopods and their taxonomy, some links to related web-sites and mailing groups, and some references. main page shows beautiful pictures of octopuses.

-Charmaine's Killer Snail Home Page
http://grimwade.biochem.unimelb.edu.au/~bgl/content.htm

the British Isles".

-Ocean Planet Home Page
http://seawifs.gsfc.nasa.gov/squid.html
The Smithsonian's on-line version of the exhibition at the National Museum of Natural History entitled "In Search of Giant Squid". This exhibition explores and interprets the mystery, beauty and complexity of giant squids - the world's largest invertebrates.

-Okinawa Slug Site
http://www.imicom.or.jp/~bolland
Web site containing information about Okinawan Opisthobranchs.

-Pecten Connection Web Site
http://www.netcom.com/~rainesbk/pectens.html
Still under construction.

-Sanibel Island Shelling Page
http://www.coconet.com/sanibel-captiva/shelling.html
Info about collecting in Sanibel Island, Florida.

-Scaphopod Page
http://www.hamilton.edu/html/Academic/bio/preynolds/scaphopoda/
It contains a Scaphopod Bibliographic Database that can be searched by character string. Currently, it holds more than 1200 references.

-Santa Barbara Museum of Natural History
http://www.rain.org/~inverts/index.html
This homepage contains a presentation of the Museum, an opportunity to ask questions of a curator, features of the month, links to the collections and the research divisions (among which is a link to the invertebrate zoology department). It features also a public programs section and information about publications, special events, and membership.

-Shellfish Web Site
http://www.shellfish.org
Just like the international shellfish listserver, the Shellfish Web Site is brought to you by the National Shellfisheries Association. In addition to information about the Association, the Web site lists positions open and sought, shellfish- and other marine-related listservers, and shellfisheries resources on the Web.

-Slug Site
http://www.electriciti.com/mdmiller
This site is devoted to the study of Opistobranch Molluscs. It contains photos of nudibranchs, references to related sites, requests for information, and links to scuba Web-sites.

-The Veliger
http://ucmp1.berkeley.edu/barryr/veliger.html
This is the homepage of the well-known American magazine on mollusks, The Veliger. It contains information about the magazine, information for contributors and subscriptions.

-Type catalogue of Recent mollusks
http://www.nmnh.si.edu/gopher-menus/Mollusks.html
This type catalogue is edited by the Division of Mollusks, National Museum of Natural History, Smithsonian Institution (USNM)
The first installment covers the Aplacophora, Monoplacophora, Polyplacophora and Scaphopoda. The remaining classes (Bivalvia, Cephalopoda and Gastropoda) will be added in segments. This type catalogue is restricted to name-bearing types: holotypes, lectotypes, neotypes and syntypes.

-Worldwide Specimen Shells
http://www.erols.com/worldwid/
Web-site of Worldwide Specimen Shells, the well-known mail order shell-dealer. This is a commercial site for conchologists interested in purchasing specimen shells and ordering them via the Internet and e-mail. The site is evolving and you can now find listings of Cypraeidae, Triviidae, Harpiidae and Chitons. On a regular basis, many more families and genera will be uploaded to the site.

-Zoological Records
http://www.york.biosis.org/zrdocs/zrprod/zr_ps.htm
Information on Zoological Record Products and Services.

POIRIERIA

Auckland Museum

Conchology Section

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"Poirieria" is the Journal of a private club which is closely associated with the Auckland Museum. "Poirieria" is NOT available from Auckland Institute and Museum Library.

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Contributions on disc or printed on a wordprocessor should use CG Times (Wordperfect) or Times New Roman (Word 5), 12pt, with titles 16pt bold and author 14pt bold. Your co-operation will help keep the appearance of our Journal consistent.

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Some back numbers of **"Poirieria"** are available.

Please send all changes of address, queries on distribution of "Poirieria", and reciprocal material to: Nancy Smith, 4 Kallista Place, Brown's Bay, Auckland 1310 New Zealand.

All other correspondence should go to: The Secretary, Mrs M. Town, 9 Otakau Rd. Milford, Auckland 9, NewZealand.

The Strombacea Re-visited

pt. II THE STROMBIDAE : CLASSIC AND BAROQUE

by John Morton

The Strombidae must by any reckoning be accounted one of the success stories of the tropical mollusca. Though some of their largest species live in the Caribbean, it is in the Indo-Pacific that they rank in numbers alongside the great legions of the mitrids, olives, terebrids and cones. These last four families are carnivorous, but none of them has attained the high motor activity, and visual alertness of the Strombidae, that are - by a seeming paradox - mere grazers on nutrient sediments or raspers and chewers of the small algae of the rock and turf.

As compared with 159 Cypraeidae - also grazing herbivores - the Strombidae have 75 full and 25 strong subspecies in ***Strombus*** (sensu lato) , with smaller totals in ***Rimella*** (3), ***Tibia*** (3) ***Terebellum*** (1) and ***Lambis*** (6). (see R. T. Abbott, 1960) . With all the diversity and novelty of their shell form, the family has attained a high plateau but the adaptive radiation of the already specialised animal is at intra-family level not extensive. The great appeal of the strombids lies in their sensational locomotor powers, their speed of response and the appearance of high optical alertness.

Reckoned by geological origin the Strombidae fall into an older section - pre-Miocene, and a younger, with ***Strombus*** (Miocene) and ***Lambis*** (early Pliocene). I have thought to call these respectively the Classic and Baroque Strombidae The analogy is far from fanciful It shows how structural forms naturally evolving can present the conventions of ornament and design picked up by human architecture. In both it is the **classic** style that comes first. Its productions are the simpler and more traditional, with a balance in all their proportions, and a certain restraint of ornament. The production - as from a Michaelangelo - is graceful rather than grandiose.

In Strombacea the classic attributes are the slender fusiform shape , and plicate axial sculpture - long retained also in aporrhaid and earlier struthiolariid shells. Classic too is the restrained simplicity of the outer lip, both in ***Rimella*** and in ***Tibia***. The principal super-addition is the shell's exhalant canal, short in ***Tibia*** but in ***Rimella*** notably prolonged over the lower whorls of the spire. In the fossil ***Semiterebellum***, the trend is to lighten and simplify the whole shell. This has proceeded to the extreme in ***Terebellum***, - to my own taste the most adaptively elegant of all the family..

The Baroque comes as a later - even post-mature - departure, both in buildings and shells. Losing the classic restraint, the baroque reach is now towards the dramatic (as of Bernini or Vanburgh), most often with increase of size. Its productions are less balanced in the round, having instead the heavy

emphasis of a single aspect that is called in architecture *facadism.* In Strombidae this is displayed in the spread and elaboration of the apertural lip. There is a loss or down-playing of the once graceful spire and delicate axial sculpture, sometimes with the production of salient nodules or spines The strong emphasis of the anterior and posterior optic squints may also be accounted baroque.

The baroque style is shown by the largest, more oramented of the ***Strombus*** series, notably in the sub-genus ***Tricornis***, with the outer lip flared and produced, often heavily loaded. In the Indo-Pacific, these comprise according to R. T.. Abbott (op.. cit.) ***tricornis, thersites, taurus, sinuatus*** and ***latissimus,*** in the East Pacific ***peruvianus*** and ***galeatus*** and in the West Atlantic ***raninus, costatus, gallus, gigas*** and ***goliath***

Among the baroque Strombidae we must also include the large strongly spined ***Lambis*** species. (Fig. 4)

In ***Strombus*** many of the smaller species contained in the large Indo-Pacific sub-genus ***Canarium*** - with or without a flared outer lip - retain a tall spire with the classic axial sculpture. The thin and light shell of ***S(C) terebellatus*** shows some parallel with ***Terebellum***, being connected back to the central form of the sub-genus through ***fragilis, mutabilis,*** then ***urceus*** .

LOCOMOTION
(Fig. 1)

We shall look first at the transformed structure of the foot that has given the locomotion its action patterns of high and spasmodic agility. Along with sudden speed goes the comic impression of alertness. The large eyes, with coloured concentric rings, are mounted on elongated optic peduncles, carrying with them the vestigial tactile tentacles. These are long-extended, taking the left eye through the anterior shell canal, and the right one through the specially fashioned "stromboid notch".

Viewed from the sole, the strombid foot shows three parts: the squarish and very mobile **propodium**, still with some power of attachment to the ground; the **mesopodium**, rounded in the midline, with no plantar surface and somewhat arched off the ground; and the **metapodium** forming a muscular hook from which the strong operculum projects free for much of its length. The operculum is a smooth-edged, curved sabre in *Lambis*, but is edged with spinous serrations in *Strombus.*

The valuable study of strombid locomotion by Bergh (1974) shows three patterns of movement.

First, normal **Forward progression** is of the lunging type, well indicated already in *Aporrhais*, though only slightly employed in the Struthiolariidae.

In the advancing strombid, as the shell is thrown forward, the foot moves relatively backward and the operculum digs in, at 45° to the forward axis and behind the shell, to which its thrust is directed. After the up-raised shell has fallen, the foot next moves forward so its stalk is again perpendicular to the substrate. At the same time the operculum is lifted, to be brought forward to its normal position, at a right angle to the foot's long axis.

The second strombid movement, levered by the operculum and powered by the metapodium, is the **righting movement** characteristic of all Strombacea. The operculum is inserted beneath the overturned shell, and with the purchase so obtained the shell is returned to dorsal side upwards. Where ***Strombus*** delivers the righting kick with the operculum, ***Lambis*** places it firmly beneath the shell, which is then pulled over by a contraction of the foot-stalk.

Third, the Strombidae have an **escape movement**. realised typically in the presence of a predatory *Conus* This comprises three motor action patterns, as recognised by Bergh: namely **tentacle wave, backward flip and run.** In backward flip the operculum moves forward and into the substrate, and the shell is forcibly thrown backwards. After it has landed, the operculum swings back to its former position. With **run**. the propodium is now turned to either side and throws the shell in the same direction. This is like normal locomotion, save that the propodium does not glide slowly. As the shell is lifted and thrown forward, the eyes are extended through their notches and the tentacles oscillate rapidly.

All through its evolution the super-family Strombacea has exploited a pre-adaptation, both for sand-buried immobility and for spasmodic fast locomotion. The first is achieved by the elaboration of the lip into an over-arched canopy, from a strong varix or rib perhaps first developed to protect the aperture from cutting away by a sand-burrowing predatory crab . The second is an emphasis of the pedal activity and shock reaction anciently inherent in prosobranch gastropods, developed to a high pitch as a protection from asteroids and Conus predators on sub-tidal sandy ground.

THE CLASSIC STROMBIDAE.
(Figs. 2, 3)

The oldest strombs still living comprise some 10 species, in. the three genera ***Rimella, Tibia*** and ***Terebellum***. All three retain a fusiform or spindle-shaped shell, with long spire, sparse ornament and no expansion of the lip. All whorls in ***Rimella*** and the early ones in ***Tibia*** preserve the axial sculpture, reminiscent of a juvenile ***Aporrhais***. The whorls are never shouldered but primitively

rounded in section; and the shell is fashioned for the strombid lunging movement. The animal appears adept also at a modified righting movement, in the mode of a continuing "roll over" .

Of these three old genera, ***Rimella*** would seem closest to the base of the family. Uniquely the animal retains separate tactile tentacles, of equal length with the optic peduncles and divergent from the very base. The foot with its serrate operculum has the finished stromboid character, while the shallow-buried posture must be very much as in ***Aporrhais, Struthiolaria*** and the smoothest and simplest of the later strombids such as ***S gibberulus***. In the three ***Rimella*** species today extant, the exhalant canal has extended its winding course over the body whorl and spire, to bring it to the reach of the exhalant hole, in the classic strombacean burrowing posture.

Tibia too shows us some of the most evidently archaic features of the Strombidae, perhaps even preceding the departure of ***Rimella***. The operculum is not sabre-like or serrate but oval and comma-shaped; and closely fills the whole aperture. The foot is less laterally compressed, the propodium being a smooth-soled segment placed flatly on the ground, and separated from the equally broad metapodium by a strong, arched instep. The chief ornamentation of the shell is the long anterior spine, solid in ***T curta***, but long and excavated as a siphonal canal in ***T. rectirostris***. ***Tibia*** has also a short crescentic exhalant canal, equivalent to the longer canal in ***Rimella***.

The Palaeocene fossil ***Semiterebellum marceauxi*** (of the English Thanet beds) suggests to us the departing point of living ***Terebellum*** from the early strombs like ***Tibia*** and ***Rimella***. The single living species ***Terebellum terebellum*** is at once the most simplified and structurally innovative of all strombs, ancient or modern. It has a light, smooth shell, with a high glazed surface stripped clean of any ornament or relief.

I first met with ***Terebellum*** alive in coral sand in the Solomon Islands at the Marovo Lagoon, New Georgia. The single live specimen was to give me an engrossing afternoon, watching its locomotion in fine, clean coral-sand. Permanently buried, *Terebellum* moves forward through the fluid sand, at the depth of two centimetres from which an optic stalk can reach the surface, with its shining turquoise eye. Extended in front this is pushed out and "winked up" through the sand, soon to be withdrawn as the animal progresses and the other eye is extruded. Locomotion under the sand is achieved by regular steps of the propodium which is muscular and labile, or - on the surface - by a rolling action that is the homologue of the righting movement of other strombs. The operculum is small but carries three strong spinules; it is withdrawn into the musculature of the metapodium, with only the spine-tips emerging.

D. P. Abbott has given a well illustrated description of the same activities, and shows the exhalant siphon like the prolongation of the mantle edge through the exhalant canal in ***Rimella***. In the absence of a raised canal applied to the shell surface, the exhalant siphon of ***Terebellum*** runs up the incised suture between the whorls, evidently right to the apex.

.In its efficient simplicity, ***Terebellum*** is by far the best adapted strombid, not only for permanent burial but for actual progression beneath the sand. It differs notably from ***Rimella*** and all other strombids in the loss of the tactile tentacles used on the surface of the sand for testing the substrate and forward exploration.

DIET AND DIGESTION
(Figs, 6, 7)

The feeding repertoire of the Strombidae is essentially unspecialised. The single major trend is from the grazing of soft deposits in ***Rimella, Tibia and Terebellum*** to the rasping of small lithophyte (rock-attached) algae in the later and larger strombids. ***Oostrombus*** is clearly a deposit feeder, as is also ***Terebellum***, though no trend has been initiated towards the struthiolariid mode of ciliary feeding.

The organs of the strombid pallial cavity (Fig.5) thus have acquired no involvement in food-collecting, With the dorso-ventral compression of the whorls (see Plate II), especially in the more advanced Strombidae, the pallial cavity is less spacious than in ***Aporrhais*** and (more markedly) in ***Struthiolaria***. The gill is narrower and its filaments shorter even than in the Aporrhaidae.. (see Morton, 1997) In all three families, the azygous pallial tentacle is to be noted, immediately distal to the anus. It has the regular function - in forms that burrow -of keeping the exhalant entry clear of sediment, doubling with the role of the left cephalic tentacle in the inhalant opening.

In relation to diet, the strombid radula (Fig. 6) shows a well-marked evolutionary trend. The early genera ***Rimella*** and ***Terebellum*** have a light dentition, with broad triangular laterals, a finely denticulate cusp to the central and long slender marginals.. This condition is evidently near the departure point of the strombs from aporrhaid forebears. The teeth (as with their ultimate reduction in the ciliary feeding ***Struthiolaria***) are used in fine detritus grazing for picking up, rather than hard rasping or triturating.

The later baroque Strombidae are the coarser-toothed grazers of algae. Though the radula remains short, with its sac hardly emerging below the pharynx, it is wider, with the teeth more robust and bearing stronger denticles.

The. strombid buccal bulb is larger, and the proboscis relatively short, with no evidence of its use in burrowing, as in ***Aporrhais*** and ***Struthiolaria***. The salivary glands are larger than in ***Struthiolaria***, but are no longer located in the trunk, with prolonged ducts, as primitively in ***Aporrhais***.

The mid-oesophagus in Strombidae forms a wide cylindrical crop, just as in ***Aporrhais***... It opens through its narrower posterior third into a stomach that displays marks of high specialisation not seen in ***Aporrhais*** or ***Struthiolaria***. (Fig. 7) These have simpler stomachs, with a short style sac containing a soft, hyaline crystalline style, of a golden colour or translucent. The style rotates within the sac which is open by a slit to the first part of the intestine. Its function is that of a capstan (or *ergatula*) (see Morton, 1960) drawing a

mucous food string into the stomach from the oesophagus. Particles shed from this string in the lower pH of the stomach come under the action an extensive ciliary sorting area of the stomach wall, that winnows out the lighter material for digestion, and sends coarser particles to the intestine.

In the Strombidae - evidently in conjunction with their heavier load of coarse pabulum - the stomach and style sac have undergone specialisation without parallel among mesogastropods. The tapering crystalline style sac is prolonged far forward, anteriorly to the visceral mass, to be enclosed within the pallial wall, where it lies to lhe left of the ctenidial axis. The long style is stiff and gelatinous, far more dense than in *Struthiolaria*. By its rotation, the strombid style serves to wind in a string of rasped and comminuted plant material, engaging this constantly upon the gastric sorting area. It acts as well in stirring and comminuting free particles lying outside the revolving cord.

I have elsewhere (Morton, 1960) shown for both mesogastropod prosobranchs and bivalves the functions of the style - or *ergatula* - as capstan, pestle, stirring rod and enzyme store. With respect to the last, the style has been widely shown to contain amylase which is released in continuous instalments as its rotating end is subjected to the lower pH of the fluid stomach contents. The strombid crystalline style (see Yonge 1932) was also shown to contain a cellulase able to split the carbohyrdrates of plant cell walls. I have since shown trace amounts of cellulase in a much wider range of molluscan styles than previous methods had revealed. In the style matrix of bivalves large commensal spirochaetes *(Cristispira)*, are regularly found, long suspected of involvement in this cellulolytic activity (see Newell, 1953), Here is a subject that deserves much further researching.

Of the mechanical efficiency of the strombid style there can be little doubting, with the traction by rotation of a heavy load of coarse debris and algal fragments, as well as a liberal intake of part-nutritious sediments. The size and robustness of molluscan styles are obviously proportioned to the bulk and weight of the food. The fresh-water *Melanopsis*, taking in a cord of sand particles covered with a nutritive film - has a thick, heavy style, as dense and robust but much shorter than in Strombidae (see Morton, 1975) Among bivalves a comparable strengthening of the crystalline style is found in the Tellinidae. These lie at the coarser end of the bivalve feeding range, being deposit-feeders on a heavy sediment load - from the thick "potage" of bottom sediment rather than the "consomme" of suspended plankton.

REPRODUCTION

(Fig. 8)

The essential lay-out of the strombid genital tract is comparable with that of *Struthiolaria* and *Aporrhais* (see Morton, 1997). Clearly the aporrhaid condition is the most basic among the Strombacea. Single egg capsules are carried direct to the ground by the oviducal groove, extending on the right to the front of the foot, and are separately affixed to sand grains. The Strombidae are distinguished by the production of a long, tangled egg-string, with its central tube inside a tougher translucent sheath and containing egg capsules of aporrhaid size, running into thousands in one production. Sand

grains are attached as a protection to the viscous outside of the string. The female genital duct of the strombids is chiefly remarkable for the narrow attenuation of the albumen gland. This is provided with a blind forward diverticulum with ciliary tracts conveying the eggs on their outward and return course. After the albumen coat has been thus acquired, the eggs pass through the capsule gland that secretes the enclosing sheath of the egg string. This is primitively unclosed, forming a long gutter in the right pallial wall, with its side-walls thickened with strong glandular tracts. This section of the glandular oviduct becomes confluent with the ciliated oviducal groove that reaches forward in the aporrhaid mode on the right side of foot to affix the egg string loosely to the ground.

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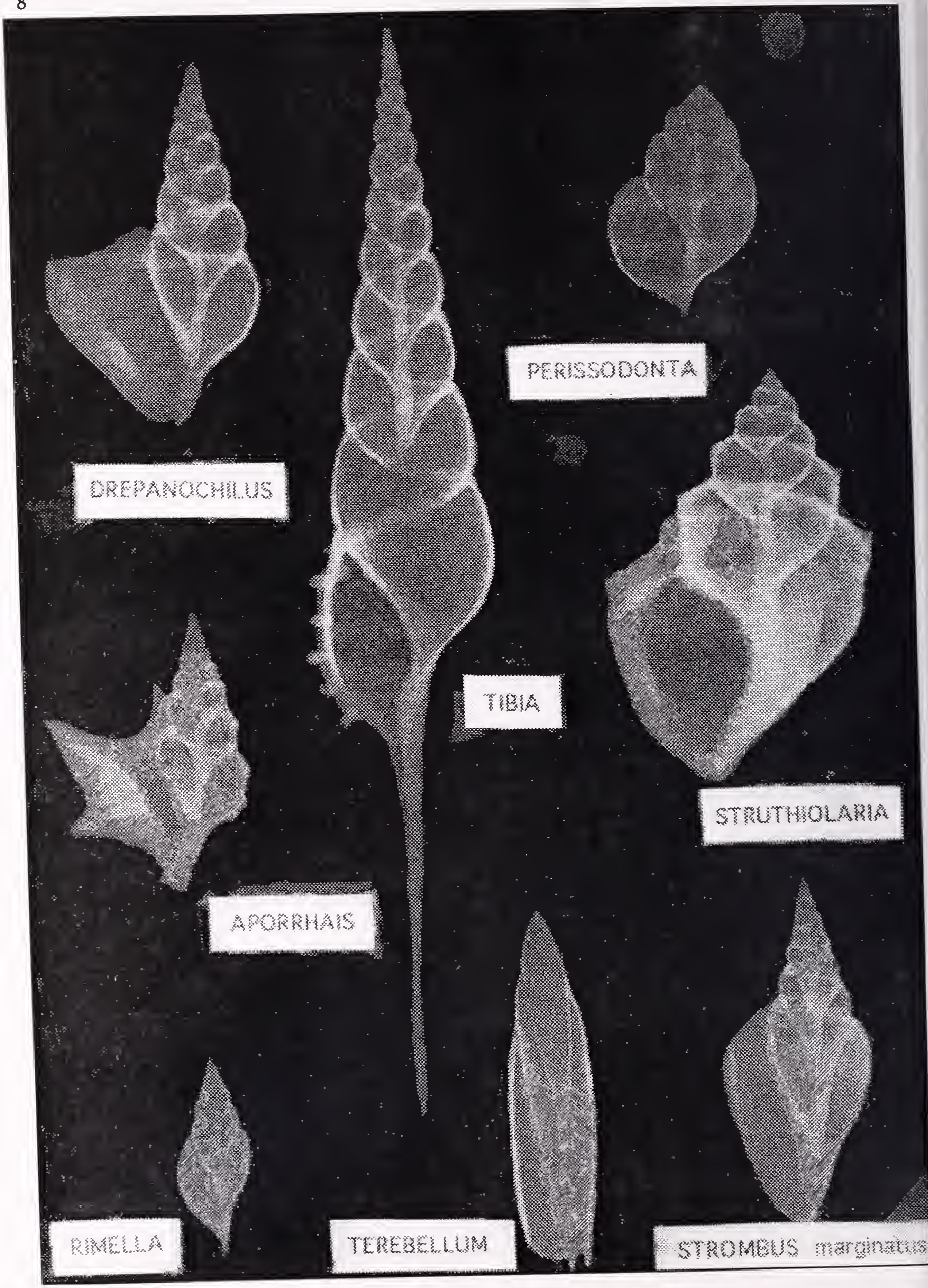


PLATE ONE

X-radiographs of a range of shells in the Strombacea.

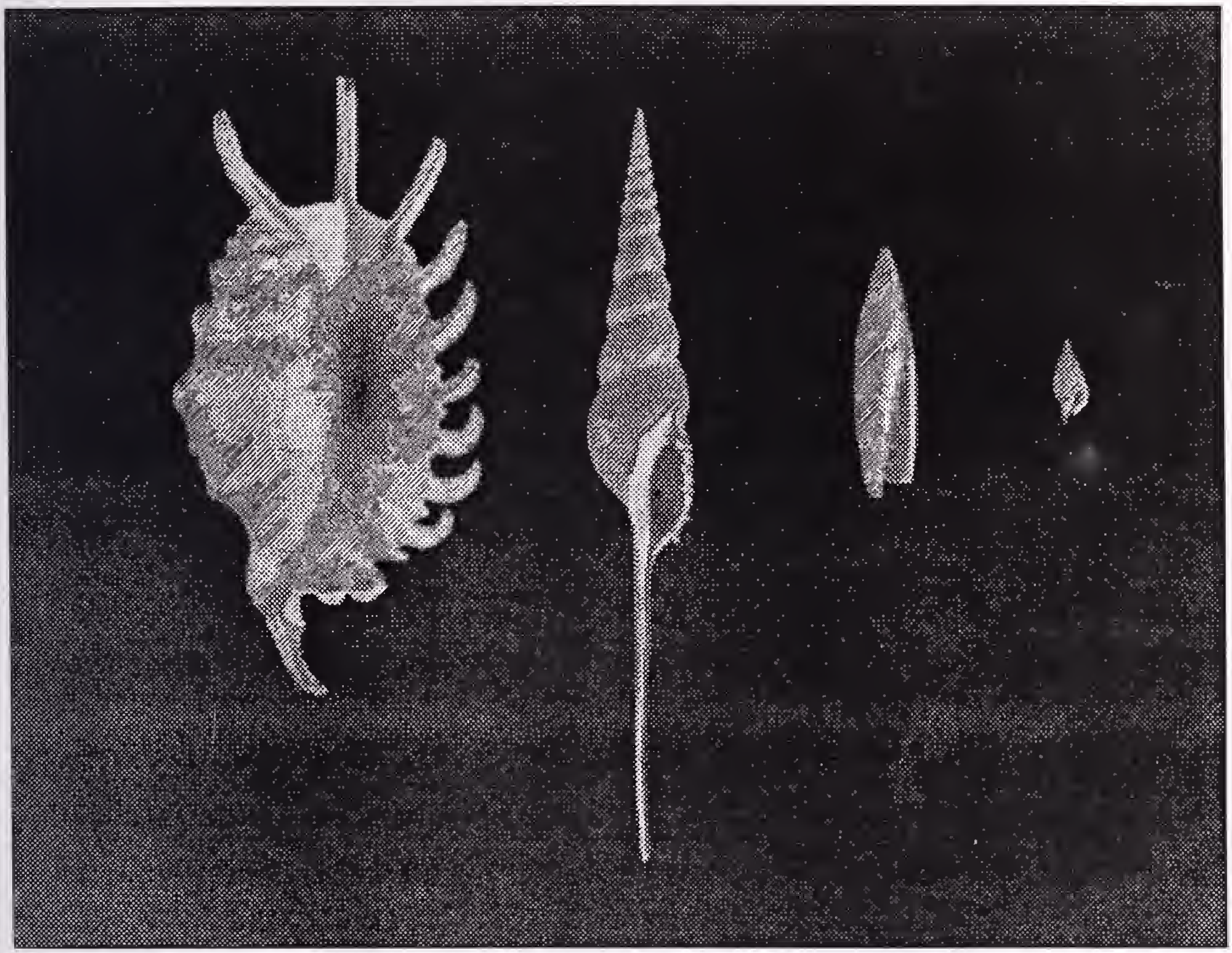


PLATE TWO

The strombid shell form

(left to right) *Lambis millepeda, Tibia rectirostris, Terebellum terebellum, Rimella canaliculata.*

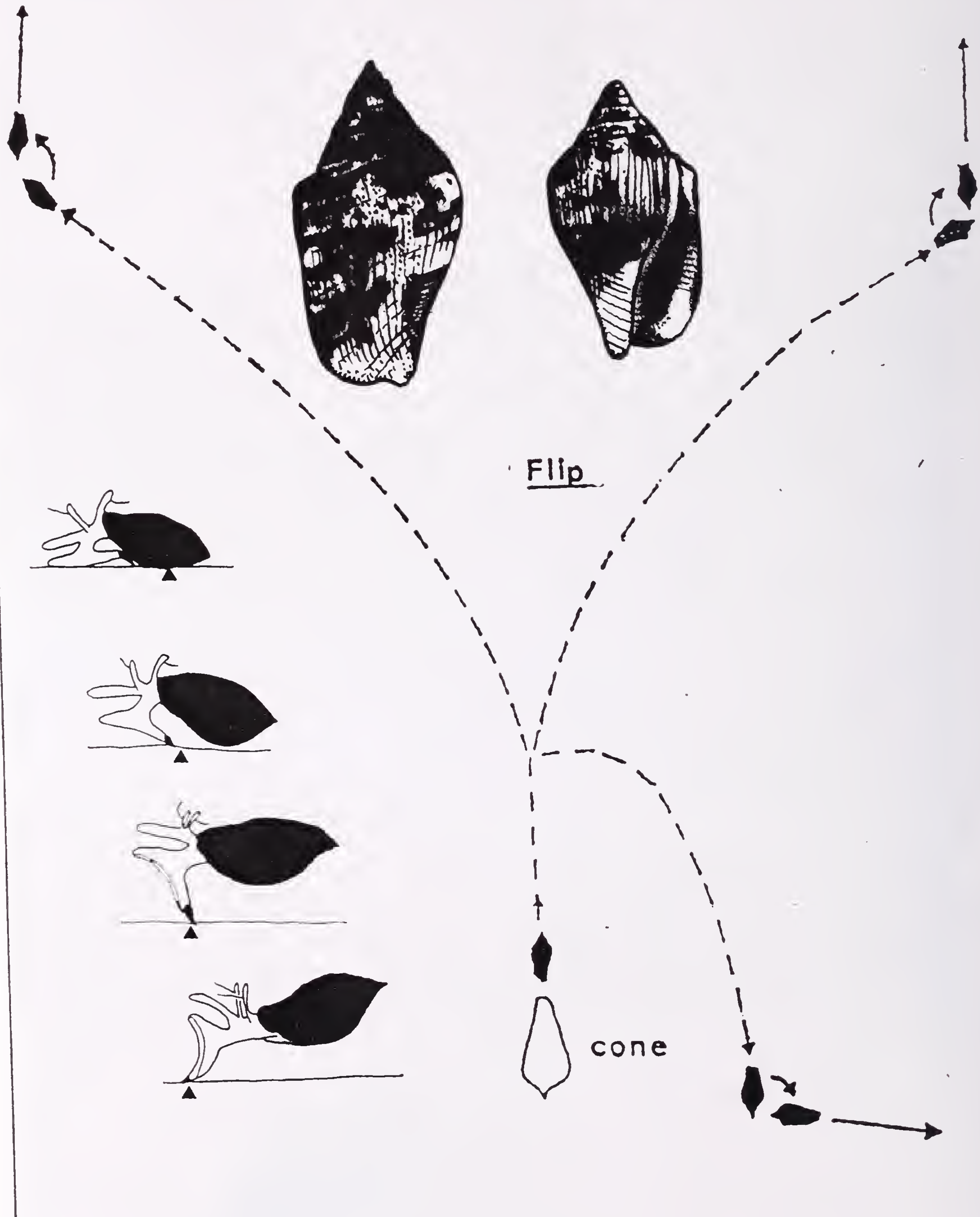


Fig. I

Locomotion of *Strombus maculatus*, showing *FLIP*, followed by *RUN*, at approach of a predatory cone (left) successive stages of backward *FLIP*.

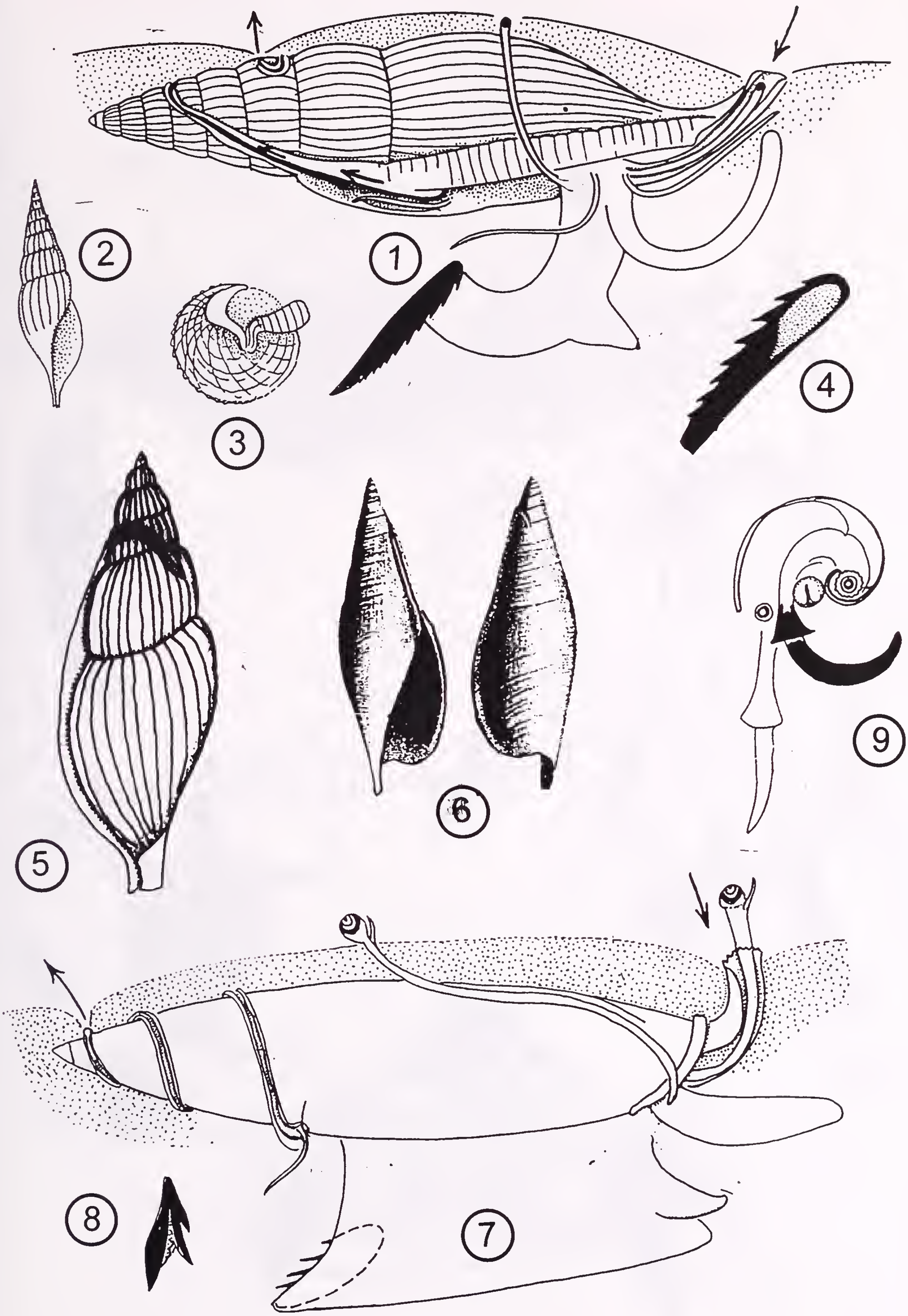


Fig. 2

(top) *Rimella canaliculata*, (I) in buried posture. (2) immature shell, (3) anterior (end-on) view of shell (4) operculum, showing foot-scar. (5) shell from above, with exhalant canal
(middle) (6) *Semiterebellum marceauxi*, fossil from Thanet Beds
(bottom) *Terebellum terebellum* (7) in buried posture (8) (8) operculum, (9) anterior (end-on) view, showing alternate positions of foot

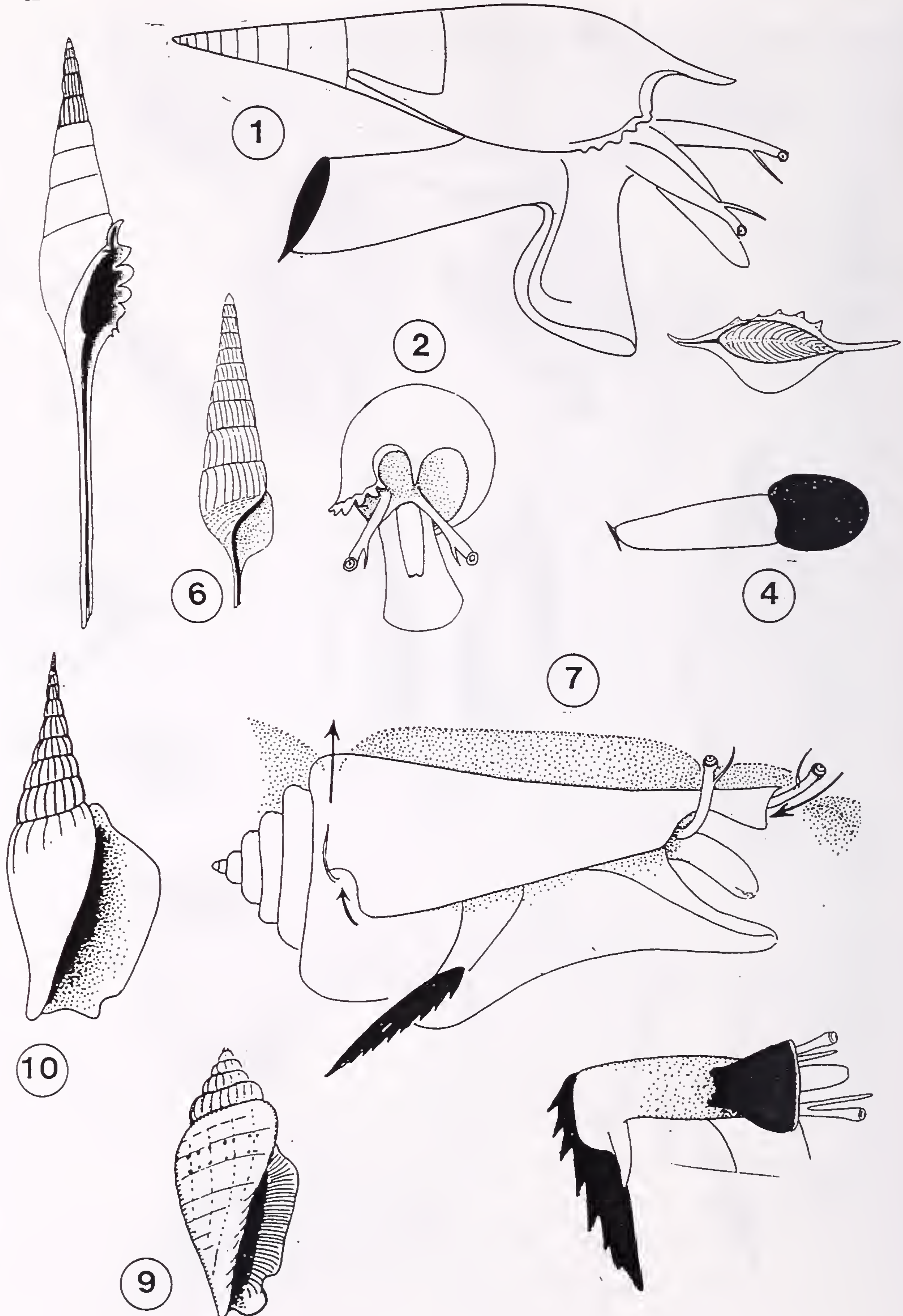


Fig. 3

(top) Tibia. (I) *Tibia curta*, extended as in buried posture (2) anteror (end-on) view, (3) operculum closing the aperture (4) lower surface of foot, with propodium black; (5) *Tibia rectirostris*; (6) immature shell.
(bottom) Strombus (7) *Strombus (Oostrombus) gibberulus*, in buried posture in sand (8) lower surface of foot, with serrate operculum, and propodium in black. (9) *S(O) gibberulus*, shell; (10) *Strombus marginatus*, shell

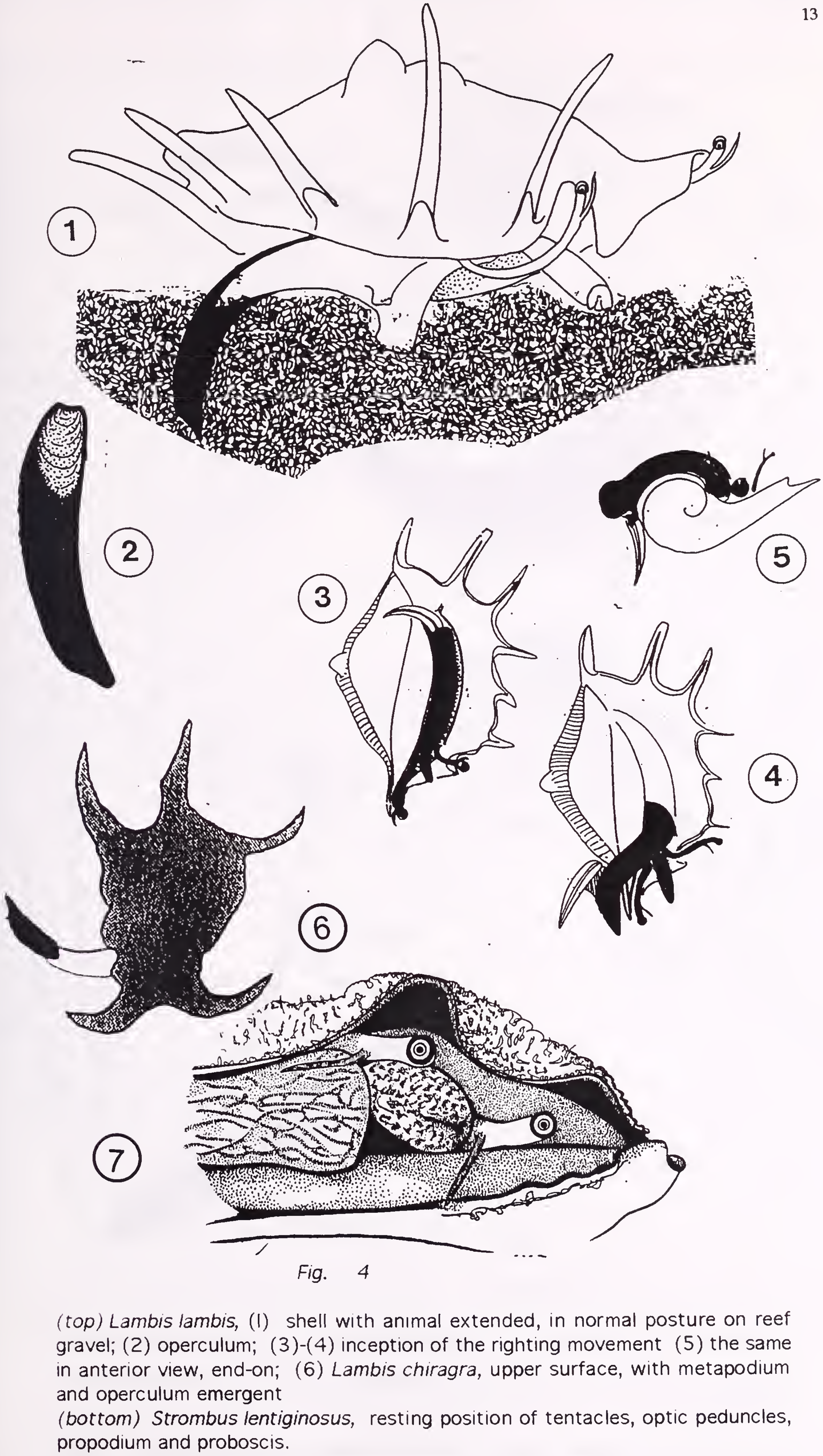
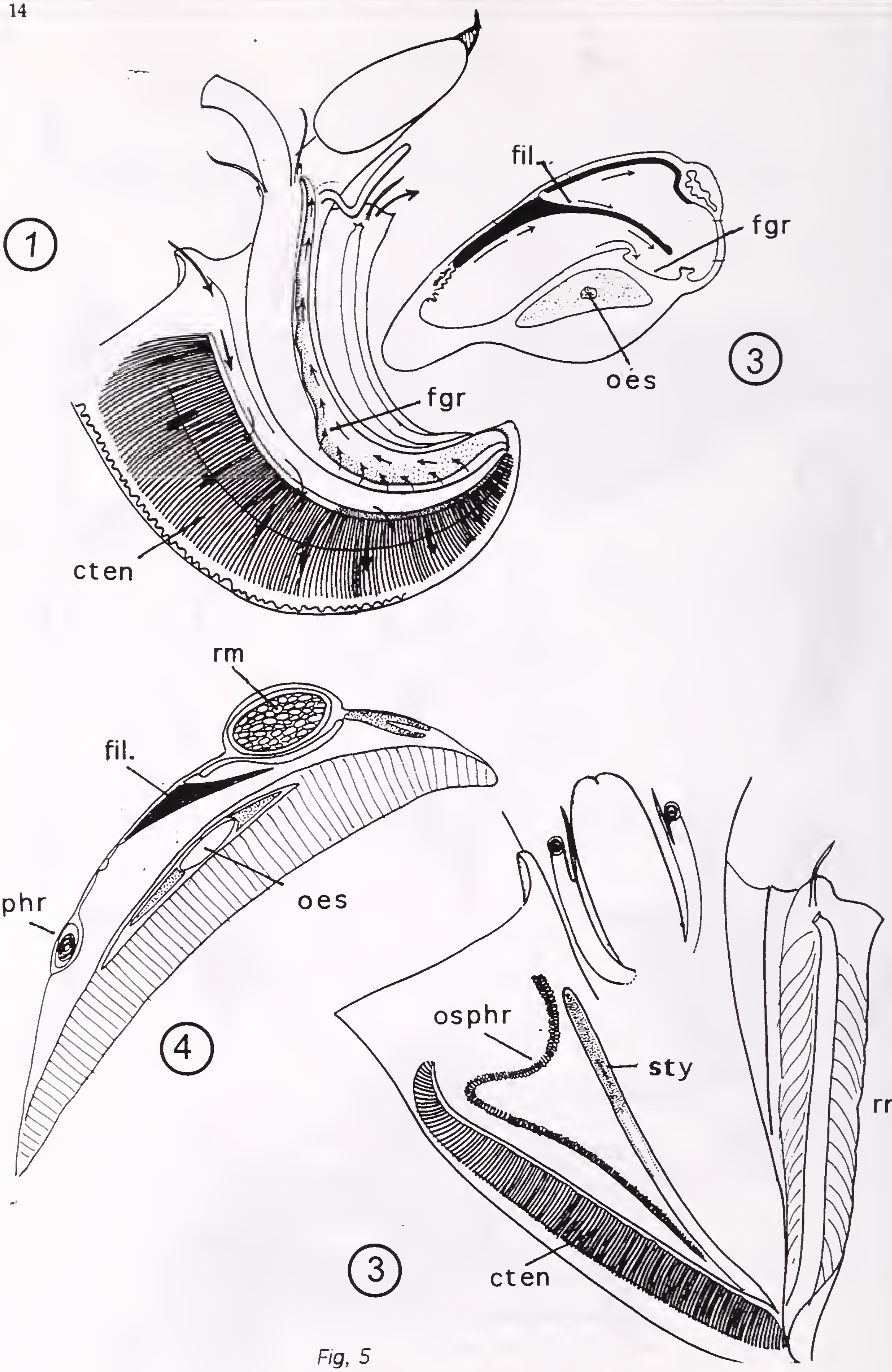


Fig. 4

(top) Lambis lambis, (I) shell with animal extended, in normal posture on reef gravel; (2) operculum; (3)-(4) inception of the righting movement (5) the same in anterior view, end-on; (6) *Lambis chiragra,* upper surface, with metapodium and operculum emergent

(bottom) Strombus lentiginosus, resting position of tentacles, optic peduncles, propodium and proboscis.



Fig, 5

Pallial Cavity

Comparison of pallial organs of (I) *Struthiolaria* and (2) *Strombus (Conomurex) luhuanus* , and transverse sections of the pallial cavity in (3) *Struthiolaria* and (4) *Strombus.*

cten gill; **fil.** ctenidial filament; **fgr** food groove **oes** oesophagus; **osphr** osphradium; **rm** rectum; **sty** crystalline style sac ;

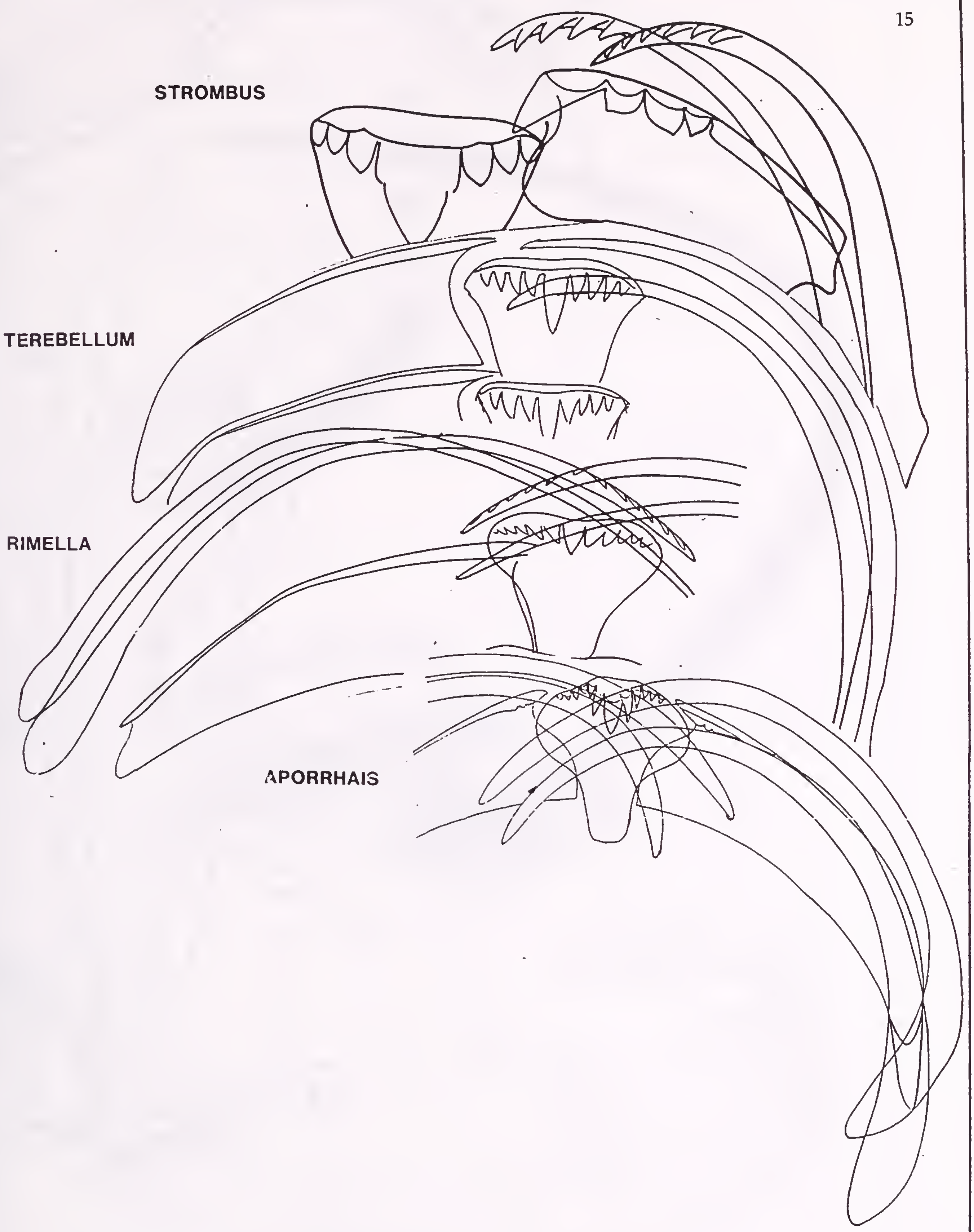


Fig. 6, The strombid radula

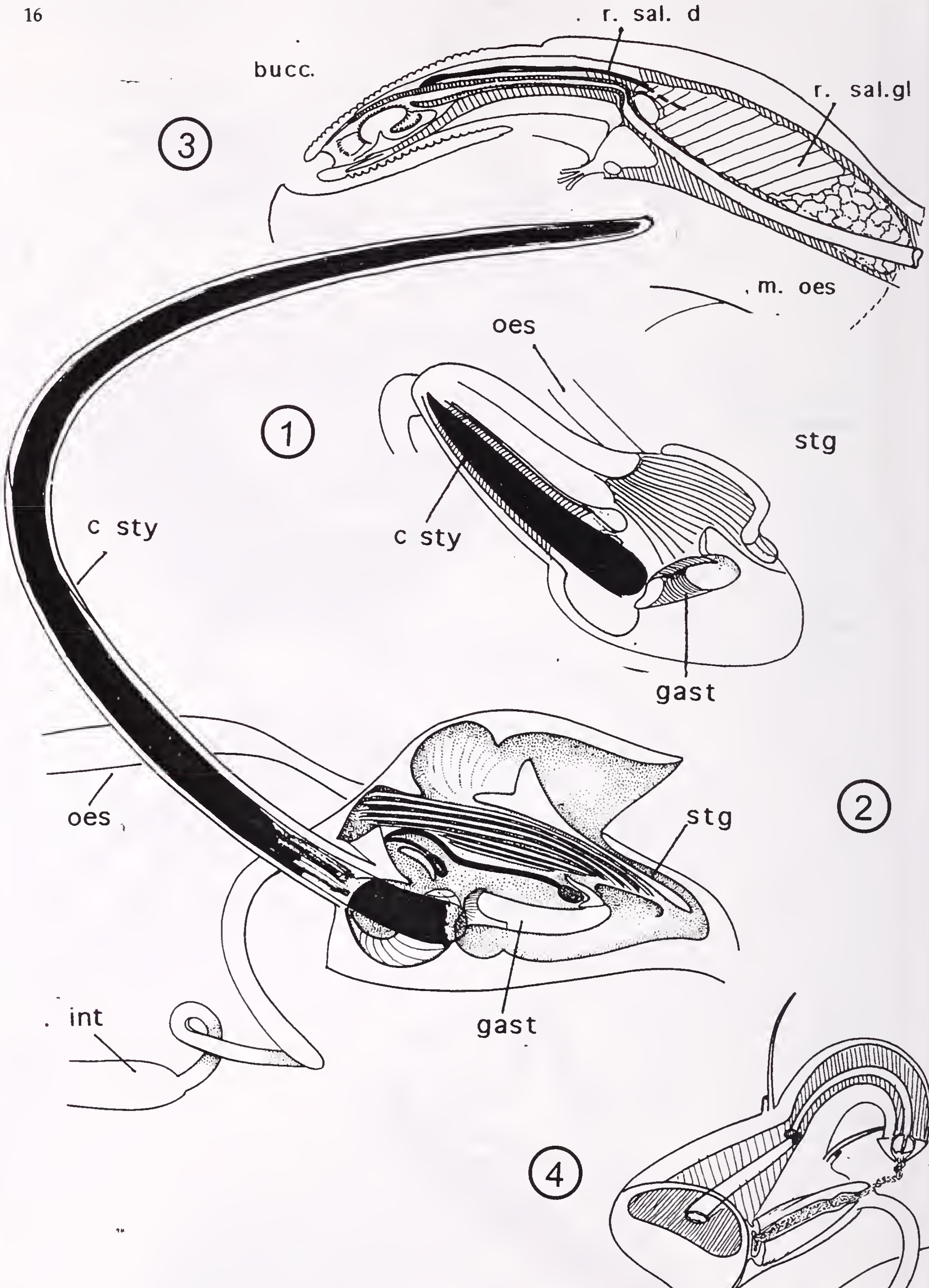


Fig. 7

Digestive System of Strombacea

Dissected stomach of (I) *Aporrhais pes-pelicani* and (2) *Strombus (Conomurex) luhuanus*, showing **c sty** crystalline style, **gastr** gastric shield, **int** intestine, **oe** oesophagus, **stg** sorting area
(3) *Aporrhais*, sagittal section of head and proboscis. **bucc**. buccal mass, **m. oes**. middle oesophagus **r. sal. d** salivary duct, **r. sal.gl** right sailvary gland
(4) *Struthiolaria*, head and proboscis, showing reduction of buccal mass and salivary glands, with proboscis positioned to ingest mucus string from food-groove.

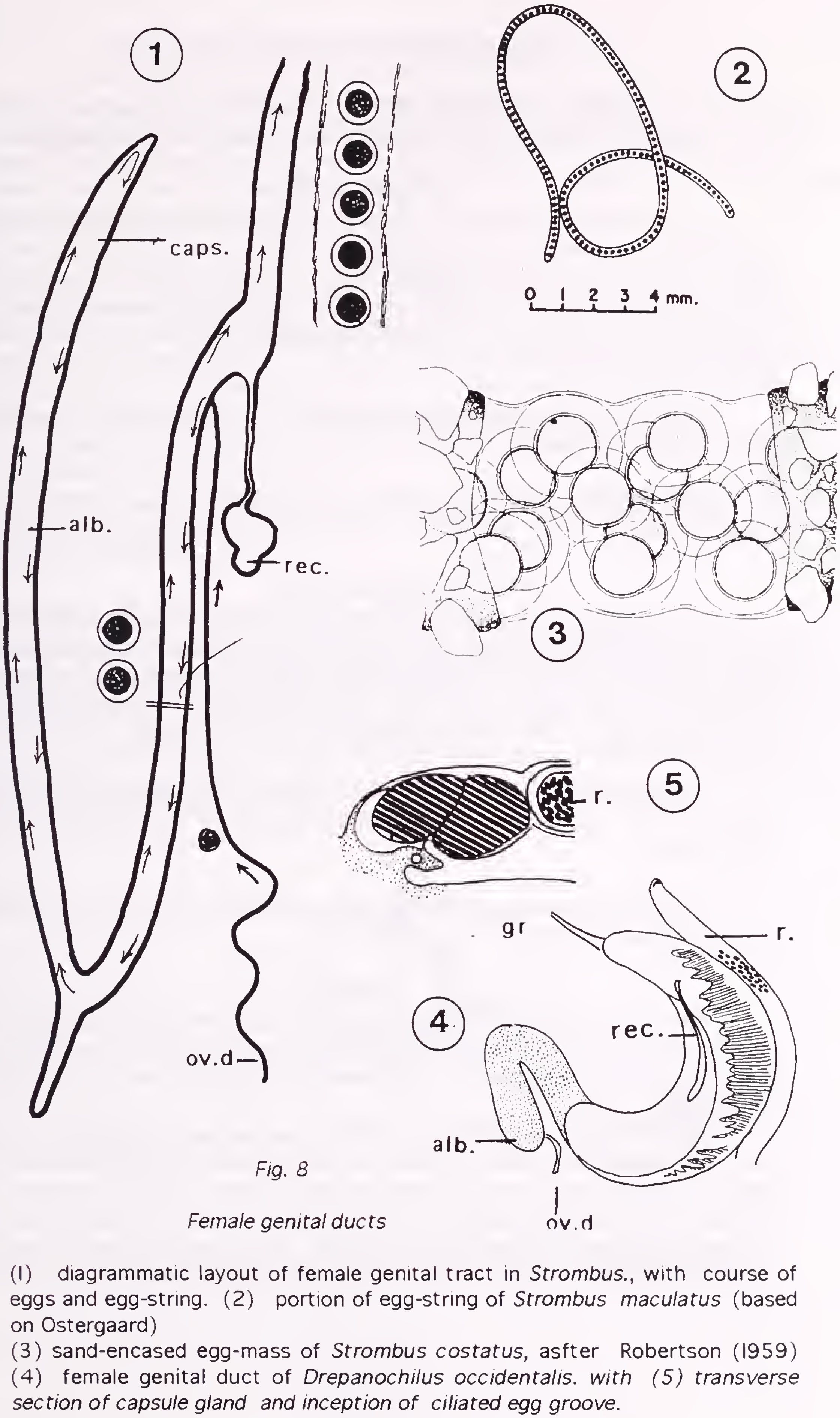


Fig. 8

Female genital ducts

(I) diagrammatic layout of female genital tract in *Strombus.*, with course of eggs and egg-string. (2) portion of egg-string of *Strombus maculatus* (based on Ostergaard)
(3) sand-encased egg-mass of *Strombus costatus*, asfter Robertson (I959)
(4) female genital duct of *Drepanochilus occidentalis. with (5) transverse section of capsule gland and inception of ciliated egg groove.*
alb. albumen gland; **caps.** capsule gland; **.g r** egg groove **ov.d** ovarian duct; **rec.** receptaculum seminis

The last word on Mission Bay sand

by Margaret S. Morley, Jim Goulstone, Bruce F. Hazelwood, Peter Poortman, Nancy A. Smith, Glenys Stace and Fiona Thompson

INTRODUCTION

This is the fourth (and last?) article on molluscs from the replenishment of Mission Bay Beach by sand dredged in 40m off the coast of Pakiri (Morley et al. Jun.1996, Morton 1996). Since the previous update (Morley et al. Oct.1996) a further 146 species of mollusc have been found. Most of the additions are the result of intensive sorting of shell sand under the microscope by two of the authors (MM, PP). The list now includes land snails and fresh water snails (JG).

There is a brief discussion on the variability of some species and an extension of range for *Naricava neozelanica.*

A few name changes missed in previous lists have been updated following Spencer & Willan (1996).

SPECIES LIST

It was felt that a complete list of molluscs would be more useful to readers than just printing additions alone. The quantitative scale of abundance has been increased from previous species lists. This is to reflect the large numbers of some species washed out of the Pakiri sand. For example well over a hundred specimens of *Coluzea spiralis* have been found, though it must be admitted, not all are in gem condition!

The quantity column for micromolluscs is not a true indication of their numbers within the sand. Doubtless the rare category of some species would change if more sand was processed.

The list of non-mollusc species remains unchanged from the first article and has not been repeated (Morley et al. Jun.1996).

UPDATE

Since the dumping of Pakiri sand stopped in May 1996, the collecting frenzy has gradually abated. After on-shore winds a few shells wash out, but are mostly damaged or single valves. Microscopic shells are still present for those with plenty of time and patience.

It is remarkable that the bulk of the Pakiri sand has stayed in position near the high tidal level, despite several severe northerly storms. However some sand has migrated outside the groynes to cover the sandstone platforms 200m to the east and west. The Auckland City Council is committed to maintaining a 15m width of sand into the future, so a further application to dredge may be needed. The current sand delights beach users. Local tourist operators include Mission Bay on their regular itinerary.

LAND SNAILS

The land snails, *Tornatellides subperforata, Cochlicopa lubrica, Lauria cylindracea* and *Helix aspersa* are all common around the Auckland waterfront, but *Cochlicella barbara* is not present in Auckland. It is however, prolific in the sandhills around Pakiri, and must have come down in the dredgings. Was it blown or maybe floated from the sand-hills four kilometres out to sea to the dredge site? We were told the barges sucked up their load of sand and sailed direct to Auckland.

DISCUSSION

1. Buccinidae *Austrofusus glans* (Roding, 1798), *A. chathamensis* Finlay, 1928

Live specimens of *A. glans* have been common in wash-ups together with a few specimens of *A. chathamensis.* This latter species is usually associated with localities on the Chatham Islands and around Cook Strait. Several specimens have been found at Mission Bay that have features grading between the two species (PP coll.).

Specimens of *A. glans* washed up in the Bay of Plenty also show some features of *A. chathamensis*. (NS pers. comm.).

These records appear to indicate that *A. glans* and *A. chathamensis* are forms of the same species. Can any readers supply records of *A. chathamensis* from the north-east coast of the North Island?

2. **Tornidae *Naricava neozelanica* Powell, 1940** (Fig. 1)

This small, little-known species is only rarely seen in collections. Localities for *N. neozelanica* are given as Tom Bowling Bay in shell sand and in a depth of 95m between Spirits Bay and the Three Kings Islands (Powell 1979). This species was reported in shell sand at Oneroa, Waiheke Island (Morley 1988). It has also been found in depths of 27m off Tiritiri Matangi Island, in the Hauraki Gulf; Wenderholm and Bland Bay (MM coll.). In the Auckland Museum collection are specimens from Rarawa, Northland, in shell sand and at a depth of 15m in the Colville Channel.

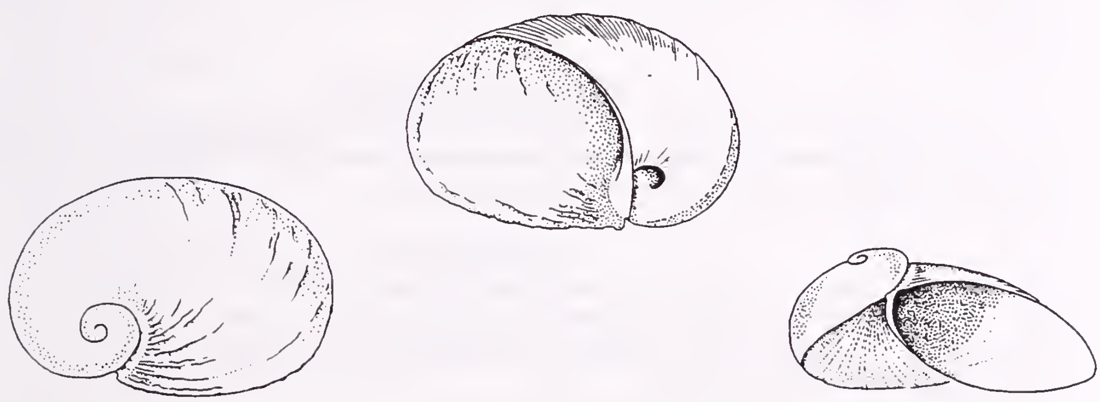


FIG. 1 *Naricava neozelanica* Powell, 1940 **Size**: Height 2.9mm Width 5.2mm

The specimen found at Mission Bay is claimed as a world record! It measures 5.2mm in width and 3.9mm in height (MM coll.) Previous published measurements are width 2.3mm and height 1.1mm (Powell 1979).

Extension of Range
The additional localities confirm an extension of range for this species, which now extends from off Spirits Bay down the east coast of Northland to the Waitemata.

3. Struthiolariidae *Struthiolaria (Pelicaria) vermis vermis* (Martyn, 1784), *S. (P.) vermis flemingi* Neef, 1970

Both subspecies have been found at Mission Bay. Hundreds of *S.(P) vermis flemingi* were found alive together with a smaller proportion of *S. (P.) vermis vermis*. Some specimens of both species were dead, stained and encrusted. These could possibly have been part of a layer sucked up from below the sand surface. The high numbers collected and observed indicate that they came predominantly from the Pakiri sand. Small specimens of *S. vermis vermis* are found locally along the Auckland waterfront, but only rarely. Many of the Mission Bay specimens have mixed features and intergrade between the two subspecies. The variable features are shell size, proportional size of the body whorl, the presence of a channelled suture and tubercles on the body whorl. A few of the shells with an inflated body whorl do not have a deeply channelled suture. This feature is said to be present in both subspecies (Powell 1979).

Since there is a series of specimens grading between *S. (P.) vermis and S. (P.) vermis flemingi* and both subspecies come from an area 400 by 300m this appears to indicate that there is only one variable species, *Struthiolaria (Pelicaria) vermis*. A large number of specimens found at Mission Bay are available for further study (BH coll.).

4. Veneridae *Tawera spissa* (Deshayes, 1835), *T. marionae* Finlay, 1928

Many *T. spissa* were alive in the wash-up during the sand replenishment on Mission Bay. Some large heavy specimens have coarse concentric ribs and no colour pattern more closely resembling the southern species *T. marionae*. Both species show variablity in shape. This raises the question as to whether or not these are two distinct species.

ACKNOWLEDGEMENTS

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PAKIRI / MISSION BAY SPECIES LIST				
410 molluscan species have been found. Voucher specimens				
are deposited in Auckland Museum collection				
KEY	Most likely source			
ID BM =identified by Bruce Marshall	m: Mission Bay	a=alive	r=rare 0-10	
MB=Mission Bay	p: Pakiri	or	p=present 10- 30	
	e: either	d=dead	c=common 30-60	
			a=abundant >60	
MOLLUSCA	**Pakiri/MB**	**Alive?**	**Quantity**	**ID B.M.**
CHITONS				
Acanthochitona mariae	p	d	r	
Acanthochitona rubiginosa	p	d	r	
Acanthochitona violacea	p	d	r	
Chiton glaucus	m	a	p	
Cryptoconchus porosus	e	d	r	
Leptochiton inquinatus	e	a	p	
Lorica haurakiensis	p	d	r	
Sypharochiton pelliserpentis	m	a	p	
GASTROPODS				
Acteon craticulatus	p	d	r	
Acteon milleri	p	d	c	
Adelphotectonica reevei	p	d	r	
Aeneator attenuata?	p	d	r	
Aeneator marshalli separabilis	p	d	p	
Aeneator comptus	p	a	p	*
Agatha georgiana	p	d	r	
Alcithoe arabica	p	a	a	
Alcithoe haurakiensis	p	d	p	
Amalda depressa	m	d	p	
Amalda mucronata	p	a	a	
Amalda australis	m	d	c	
Amalda novaezelandiae	p	d	a	
Amphibola crenata	m	d	p	
Amphithalamus falsestea	p	d	r	
Antiguraleus sp.	p	d	r	
Antimelatoma ahiparana	p	d	r	
Antimelatoma buchanani maorum	p	d	p	
Antisolarium egenum	e	a	a	
Aoteatilia larochei	p	d	r	
Aplysia parvula	m	d	r	
Archidoris wellingtonensis	p	a	r	
Argobuccinum pustulosum tumidum	p	d	r	
Astraea heliotropium	p	d	r	
Attenuata finlayi	p	d	r	*
Austrodiaphana maunganuica	p	d	r	
Austrofusus chathamensis	p	d	r	
Austrofusus glans	p	a	a	
Austromitra rubiginosa	p	d	p	
Bouchetriphora pallida	p	d	r	
Brookula aff. prognata	p	d	r	
Brookula finlayi	p	d	r	
Brookula rotula	p	d	r	
Buccinulum linea	m	a	p	
Buccinulum linea fuscozatum	p	d	r	
Buccinulum pallidum powelli	p	d	r	*
Buccinulum vittatum	m	d	p	
Bulla quoyii	m	d	p	

Bullina lineata	p	d	p	
Cabestana spengleri	p	d	p	
Cabestana tabulata	p	d	r	
Caecum digitulum	e	d	p	
Calliostoma osbornei	p	d	r	
Calliostoma pellucidum	p	a	r	
Calliostoma punctulatum	p	a	p	
Calliostoma selectum	p	a	r	
Calliostoma tigris	p	d	r	
Cantharidus purpureus	p	d	r	
Casmaria ponderosa perryi	p	d	r	
Cellana radians	m	a	c	
Charonia lampas rubicunda	p	a	r	
Chemnitzia spp.	e	d	r	*
Chemnitzia zelandica	p	d	r	
Cirsonella aff. laxa	p	d	r	
Cirsonella consobrina	p	d	r	
Cirsonella n.sp.	p	d	r	*
Cirsostrema zelebori	e	d	r	
Coluzea spiralis	p	d	a	
Cominella adspersa	e	a	c	
Cominella glandiformis	m	a	p	
Cominella maculosa	m	d	r	
Cominella quoyana	p	d	a	
Cominella virgata virgata	e	d	r	
Crepidula costata	e	d	c	
Crepidula monoxyla	e	d	p	
Crepidula youngi	p	d	r	
Crosseola bollonsi	p	d	c	*
Crosseola vesca	p	d	r	
Cumia reticulata	p	d	r	
Cylichna thetidus	p	d	a	
Cymatium exaratum exaratum	p	a	r	
Cymatium labiosum	p	d	r	
Cymatium parthenopeum	p	a	c	
Daphnella cancellata	p	d	r	
Dendropoma planata	p	d	r	
Dicathais orbita	e	a	p	
Diloma subrostrata	m	d	p	
Eatoniella limbata	p	d	r	
Eatoniella notata	p	d	r	
Elachorbis subtatei	p	d	r	
Emarginula striatula	p	d	a	
Epitonium bucknilli	p	d	r	
Epitonium jukesianum	e	d	r	
Epitonium minora	p	d	c	
Epitonium sp.	p	d	r	
Epitonium tenellum	e	d	r	
Eulimella coena	p	d	r	
Eulimella levilirata	p	d	r	
Eulima spp.	p	d	r	*
Gadinia conica	p	d	r	
Glaphyrina caudata	p	a	p	
Globisinum drewi	p	d	r	
Glyptophysa variabilis	m	d	r	
Gumina dolichostoma	p	d	r	*
Gumina minor	p	d	r	
Haliotis australis	p	d	r	
Haminoea zelandica	m	d	r	
Haustrum haustorium	m	d	p	
Herpetopoma bella	e	d	r	
Herpetopoma larochei	p	d	r	
Heterocithara mediocris	p	d	r	*
Hipponix conicus wattae	p	d	r	
Homalopoma nana	p	d	r	
Hypermastus bulbula	p	d	r	
Lamellaria ophione	e	d	r	
Lepsiella scobina	m	d	p	
Leuconopis obsoleta	m	d	r	
Liracraea odhneri	p	d	r	*
Liratilia conquista conquista	p	d	r	*
Liratilia elegantula	p	d	r	

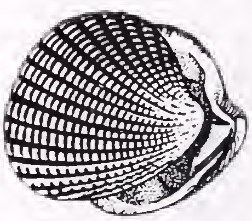
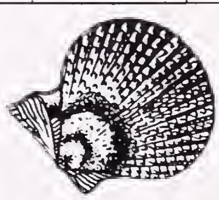
Liratilia sinuata	p	d	r	
Maoricolpus roseus roseus	e	d	a	
Maoricrater explorata	p	d	r	
Marinula filholi	m	d	r	
Melagraphia aethiops	m	a	c	
Melanella bollonsi	p	d	r	
Melanella sp.	p	d	r	
Melanella vegrandis	p	d	r	
Melanochlamys cylindrica	p	a	r	
Melanopsis trifasciata	m	d	r	
Merelina lyalliana	p	d	r	*
Metaxia exaltata	p	d	r	
Micrelenchus dilatatus	p	d	c	
Micrelenchus rufozonus	p	d	a	
Micrelenchus sanguineus	m	d	r	
Micrelenchus tenebrosus	m	a	p	
Monophorus fascelina	p	d	r	
Murdochella cf. alacer	p	d	r	*
Murdochella levifoliata	p	d	r	*
Murexul mariae	p	d	r	
Murexul octogonus	p	a	c	
Naricava neozelanica	p	d	r	
Nassarius aoteanus	p	d	r	
Neoguraleus amoenus	p	d	c	
Neoguraleus huttoni	p	d	r	
Neoguraleus interruptus	p	d	p	*
Neoguraleus murdochi	p	d	r	
Neoguraleus sandersonae	p	d	r	
Neoguraleus sinclairi	e	d	r	
Nerita atramentosa	m	a	c	
Nilsia cuvieriana	p	d	r	*
Nodilittorina antipodum	m	a	a	
Notoacmea sp.	p	d	r	
Notoacmea subtilis	p	d	r	
Nozeba emarginata	e	d	r	
Obexomia densilirata	p	d	r	
Odostomia chordata	p	d	r	*
Odostomia haurakiensis	p	d	r	
Odostomia incidata	e	d	p	
Odostomia pervaga	p	d	r	
Odostomia vestalis	p	d	r	
Onoba delli	p	d	r	
Ophicardelus costellaris	e	d	p	
Paratrophon quoyi	m	d	r	
Paxula paxillus	p	d	r	*
Peculator dissimilis	p	d	r	*
Peculator hedleyi	p	d	r	
Penion cuvierianus cuvieranus	p	d	r	
Penion sulcatus	p	a	a	
Pervicacia tristis	e	d	p	
Phenatoma rosea	p	d	a	
Phenatoma zealandica	p	d	a	
Philine auriformis	p	a	r	
Philine powelli	p	d	r	*
Philine umbilicata	p	d	r	*
Pisinna n. sp.	p	d	r	*
Pisinna semisulcata	p	d	r	
Pisinna zosterophila	e	d	r	
Pleurobranchaea maculata	p	?	r	
Poirieria zelandica	p	a	p	
Polinices simiae	p	d	r	
Powellisetia subtenuis	p	d	p	
Prolixodens infracolor	p	d	r	*
Proxiuber australe	e	d	r	
Proxiuber hulmei	p	d	r	
Pupa kirki	p	d	p	
Pusillina semireticulata	p	d	r	*
Ranella australasia australasia	p	a	p	
Retusa oruaensis	p	d	r	
Rhizorus nesentus	p	d	r	
Risellopsis varia	m	d	r	
Rissoina achatina	p	d	r	*

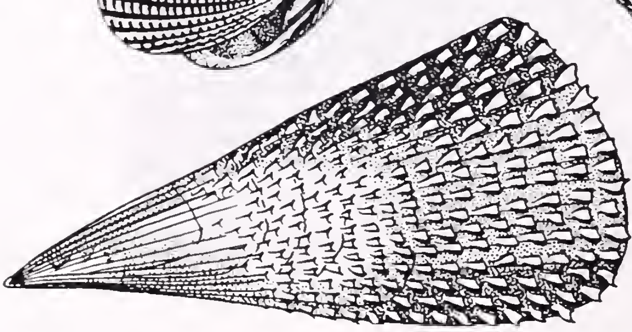
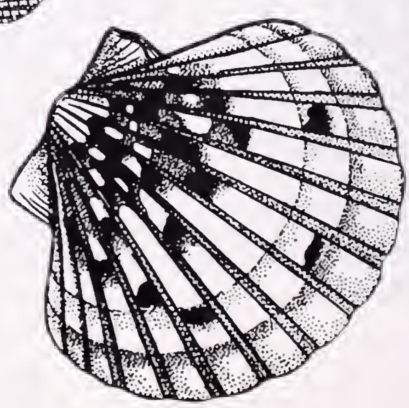
Rissoina chathamensis	p	d	r	
Rissoina manawatawhia	p	d	r	*
Rissoina sp.	p	d	r	
Rissoina zonata	e	d	r	
Sassia palmeri	p	a	r	
Sassia parkinsonia	p	d	r	
Scrinium neozelanicum	p	d	r	
Scutus antipodes	m	a	r	
Seila terebelloides	p	d	p	
Semicassis labiata	p	d	r	
Semicassis pyrum	p	a	a	
Serpulorbis zelandicus	e	d	r	
Sigapatella novaezelandiae	e	a	p	
Sinuginella larochei	p	d	p	
Sinuginella pygmaea	p	d	r	
Sinuginella pygmaeiformis	p	d	r	
Sinuginella tryphenensis	p	d	r	
Siphonaria australis	m	d	r	
Siphonaria propria	p	d	r	
Spectamen tryphenense	p	a	a	
Splendrillia aoteana	p	d	p	
Splendrillia larochei	p	d	r	
Stephopoma rosea	e	d	p	
Striodostomia orewa	p	d	r	
Struthiolaria papulosa	e	a	a	
Struthiolaria vermis flemingi	p	a	a	
Struthiolaria vermis vermis	p	a	a	
Styliola subula	p	d	p	
Suterilla neozelanica	m	d	r	
Synthopsis caelata	p	d	r	*
Symola lurida	p	d	r	
Symola menda	p	d	r	
Tanea zelandica	p	a	a	
Taranis nexilis bicarinata	p	d	r	*
Taron dubius	m	d	r	
Terefundus cuvierensis	p	d	r	*
Thoristella oppressa	p	d	r	
Tomopleura albula	p	d	r	
Tonna sp.	p	d	r	
Trichosirius inornatus	p	d	r	
Trivia merces	p	d	p	
Trochus tiaratus	p	a	p	
Trochus viridis	e	a	c	
Tugali suteri	e	d	r	
Turbo smaragdus	m	d	c	
Turridae	p	d	r	
Uttleya arcana	p	a	a	
Veprecula cooperi	p	d	r	
Volvarinella fusula	p	d	r	
Xenophora neozelanica	p	a	p	
Xymene ambiguus	p	a	p	
Xymene huttoni	p	d	r	*
Xymene mortenseni caudatinus	p	d	c	
Xymene plebeius	m	d	p	
Xymene pusillus	p	d	r	
Zaclys murdochi	p	d	r	*
Zeacolpus delli	p	d	r	
Zeacolpus pagoda	p	d	a	
Zeacolpus vittatus	p	d	r	
Zeacumantus lutulentus	m	d	a	
Zeacumantus subcarinatus	m	d	p	
Zebittium exile	p	d	r	
Zegalerus tenuis	e	a	a	
Zelippistes benhami	p	d	r	
Zemitrella annectens	p	d	r	
Zemitrella attenuata	p	d	r	
Zemitrella choava	p	d	p	
Zemitrella fallax	p	d	a	
Zemitrella pseudomarginata	p	d	r	
Zemitrella regis	p	d	r	
Zemitrella spp.	p	d	r	*
Zemitrella stephanophora	p	d	r	

Zeradina ovata	p	d	r	
Zeradina producta	p	d	p	
Zethalia zelandica	e	d	a	
LAND & FRESH WATER MOLLUSCS				
Cochlicopa barbara	p	d	r	
Cochliocopa lubrica	m	d	r	
Helix aspersa	m	d	r	
Lauria cylindracea	m	d	r	
Potamopyrgus antipodarum	m	d	r	
Potamopyrgus pupoides	m	d	r	
Tomatellides subperforata	m	d	r	

BIVALVES	Pakiri/M.B.	Alive?	Quantity	ID BM
Acar sociella	p	d	r	
Acar sandersonae	p	d	r	
Anadara trapezia	p	d	r	
Anisodonta alata	p	d	r	
Anomia trigonopsis	e	d	p	
Arthritica bifurca	e	d	r	*
Atrina pectinata zelandica	e	d	a	
Austrovenus stutchburyi	m	a	c	
Barbatia novaezelandiae	p	d	p	
Barnea similis	m	d	c	
Bassina yatei	e	d	p	
Borniola reniformis	e	d	r	
Chlamys gemmulata	p	d	a	
Chlamys zelandiae	e	d	a	
Condylocardia pectinata chathamensis	p	d	r	
Corbula zelandica	e	a	a	
Crassostrea gigas	m	a	a	
Crenella radians	p	d	r	
Hamacuna aupouria	p	d	r	
Cuspidaria trailli	p	d	r	
Cyclomactra ovata	m	d	r	
Cyclopecten sp.	p	d	r	
Diplodonta globus	p	d	r	
Diplodonta striatula	p	d	p	
Divaricella huttoniana	p	d	r	
Dosina zelandica	e	d	c	
Dosinia anus	p	d	r	
Dosinia subrosea	e	d	a	
Dosinia lambata	e	d	r	
Dosinia maoriana	p	a	a	
Elliptotellina urinatoria	p	d	p	
Felaniella zelandica	e	a	c	
Gari convexa	p	d	p	
Gari lineolata	p	d	p	
Gari stangeri	e	a	c	
Glycymeris modesta	e	a	p	
Hamacuna n. sp.	p	d	r	*
Hiatella arctica	e	d	r	
Hunkydora australica novozelandica	p	d	r	
Irus elegans	m	d	r	
Irus reflexus	m	d	p	
Kellia cycladiformis	p	d	r	
Lasaea hinemoa	m	d	r	
Leptomya retiaria	e	d	p	
Limaria orientalis	e	d	r	
Limatula aupouria	p	d	r	
Limatula maoria	p	d	p	
Limatula vinlis	p	d	r	*
Macomona liliana	m	d	c	
Mactra murchisoni	p	d	r	
Melliteryx parva	e	d	r	
Mesopeplum convexum	p	a	a	
Modiolarca impacta	p	a	c	
Modiolus areolatus	p	d	r	
Musculista senhousia	m	d	p	
Myadora antipodum	p	d	p	
Myadora boltoni	p	d	r	
Myadora striata	e	a	c	

Myadora subrostrata	p	a	c	
Mylitella vivens vivens	p	d	a	
Myllita stowei	e	d	r	
Mysella larochei	p	d	r	*
Mytilus edulis galloprovincialis	p	d	r	
Neolepton antipodum	e	d	r	
Notocallista multistriata	p	a	c	
Nucula hartvigiana	e	d	p	
Nucula nitidula	e	d	p	
Periploma angasi	m	d	a	
Oxyperas elongata	p	d	p	
Panopea smithae	p	d	r	
Panopea zelandica	p	d	r	
Paphies australis	m	a	a	
Paphies donacina	p	d	r	
Paphies subtriangulata	e	d	p	
Paphies ventricosa	p	d	r	
Parilimya neozelanica	p	d	r	
Parvithracia cuneata	p	d	r	
Pecten novaezelandiae	p	d	a	
Perna canaliculus	e	d	p	
Peronaea gaimardi	e	d	r	
Pholadidea suteri	m	d	r	
Pleuromeris latiuscula benthicola	p	d	r	
Pleuromeris latiuscula latiuscula	p	d	r	*
Pleuromeris paucicostata	p	d	r	
Pleuromeris zelandica	e	d	p	
Pododesmus zelandica	e	d	r	
Poromya neozelandica	p	d	p	
Pratulum pulchellum	p	d	a	
Pseudoarcopagia disculus	e	d	r	
Ruditapes largillierti	e	d	p	
Saccella bellula	p	d	r	
Saccella hedleyi	p	d	r	
Saccostrea cucullata	m	a	c	
Scalpomactra scalpellum	e	d	p	
Serratina charlottae	p	d	r	
Soletellina nitida	m	d	p	
Soletellina siliquens	m	d	r	
Spisula aequilateralis	p	d	p	
Talabrica bellula	p	d	r	
Tawera spissa	e	a	a	
Thracia vegrandis	p	d	r	
Tiostrea chilensis lutaria	p	d	r	
Trichomusculus barbatus	p	d	r	
Tucetona laticostata	p	d	p	
Venericardia purpurata	e	a	a	
Volupicuna mayi	p	d	r	*
Volupicuna waikukuensis	p	d	r	
Xenostrobus pulex	m	a	a	
Zelithophaga truncata	m	a	r	
Zenatia acinaces	p	d	r	


Dr Powell's Schoolboys

It was during 1930 that Mr Powell noticed a few boys examining his exhibition in the Shell Gallery. This led to an invitation to explore what lay behind the scenes in the depths of the Museum - we were quickly captivated - and soon there commenced regular meetings in Mr Powell's sanctum after school on Wednesdays. I think Charlie Fleming was previously known to A W P; he attended King's College. The rest of us were at Auckland Grammar, Bill Perks, Jack Price, Ron Price, myself, and, a little later, Walton Russell. He got us to write essays on our collecting trips and awarded shells as prizes. Some of us were soon devoting more attention to our new interest than to homework, receiving an introduction to the full range of Conchology, marine, terrestrial and aquatic, acquiring copies of Bucknill's "Sea Shells of NZ" for guidance. Later I bought a second hand copy of Suter's Manual for 7s 6d (75c). The coastline from Bastion Point to Lady's Bay reef was scoured regularly, our concerted collecting must have had a deleterious effect on the survival rate of some species in the area . By mid 1932 I had obtained contacts overseas, resulting in constant raids on the local resources to acquire exchange material, which continued until 1935. This must have furthered the decline of the local fauna. AWB did not set a good example in this respect. I remember my first feeling of conservation concern when he showed us the results of a visit to Blumine Island, a vast collection of live Paryphanta hochstetteri bicolor. I wondered, why so many? When he showed us the location of a colony of Notoacmea scopulina at Muriwai there was no suggestion of limiting the number collected.

When possible we quickly accepted invitations to take part in Museum trips in company with Lucy Cranwell, botanist; Dr Falla, ornithologist, AWB, and, occasionally the Director, Dr Archey. We absorbed what we could from this assemblage of learning, visiting such places as Whatipu, Muriwai and launch trips on the Manukau Harbour and Hauraki Gulf . We were indeed fortunate to be in the company of such experts. I remember on one launch trip bound for the Noises, we stopped on the way to dredge off Hobson Bay, when AWB found what he was looking for, a live Dosinia greyi. On that same trip, at Maria Island, I watched in amazement as Mr Pycroft, an amateur naturalist, shot six Fairy Terns on the wing for display in the Museum. We landed on the island and I can remember falling knee-deep into the Shearwater burrows. We paid occasional visits to Takapuna reef, Charlie Fleming's preserve. I remember his chagrin when I found there a Haliotis iris, alive. I later found three large ones on the Rangitoto Beacon reef.

Then there is the one that got away! We had parked our bikes on the vehicular ferry for the crossing to Devonport, when looking over the side, there, on a wharf pile, out of our reach, was a magnificent Calliostoma pellucida, the animal fully extended and cavorting in front of us. We were about to take some drastic action to collect this treasure when, fortunately for us, the ferry moved off, leaving both collectors and quarry alive and well.

My collection was further enriched by visits to the trawlers, which yielded a good representative collection of deep water material.

We kept our collections in individual trays, following AWB's practice, but later, on a visit to Charlie Fleming's den, I found that he had a cabinet with sliding drawers, so under my father's guidance, I built my first cabinet along similar lines, with 18 drawers. By the time I left home to go overseas to the Solomons in 1938 there were two such cabinets, which were fortunately preserved by my parents until such time as I got my own home many years later. Like rabbits they have continued to multiply. Bill Perks moved to Australia until his retirement, but his collection was preserved until his recent death. I don't know what happened to the Price collections. Sadly, Walton Russell died suddenly at the age of 15. His father had a glass display case made and asked me to arrange and label the collection which was then installed in the foyer of Kohimarama School, where it remained for many years.

But to get back to what I was asked to do - here is a list of species collected in the Mission Bay - St Heliers Bay area in the 1930/34 period.

Terenochiton inquinatus	
Ischnochiton maorianus	
Amaurochiton glaucus	
Sypharochiton pelliserpentis	
Acanthochiton zelandica	
Cryptoconchus porosus	- Kohi reef
Scutus breviculus	
Tugali elegans	
Cellana ornata	
Notoacmea daedala	
Melagraphia aethiops	
Diloma zelandica	- breakwater, Hobson Bay
Diloma subrostrata	
Micrelenchus tenebrosus	- wash ups
Fossarina rimata	- Bean Rock reef, one only
Trochus viridis	
Calliostoma pellucida	- hermit crab bed
Turbo smaragdus	
Cookia sulcata	- one specimen only, Kohi reef, 105mm base measurement
Nerita melanotragus	

Realia egea - Orakei bush
Littorina unifasciata
Risellopsis varia
Dardanula olivacea
Estea zostrerophila
Scrobs hedleyi
Rissoina chathamensis
Potomopyrgus pupoides - Kohi creek
Zeacolpus vittatus
Zeacumanthus lutulentus
Zeacumanthus subcarinatus
Struthiolaria papulosa - alive, Mission Bay, frequent
Struthiolaria vermis - alive, Mission Bay, frequent
Sigapatella novaezelandiae
Maoricrypta costata
Maoricrypta monoxyla
Lamellaria ophione - one only, Bean Rock reef
Trivia merces - one, dead, Kohi beach
Cabestana spengleri - Parnell reef, several over a period
Murexsul octogonus
Xymene plebeius
Lepsiella scobina
Lepsiella scobina albomarginata
Haustrum haustorium
Neothais sealaris
Paxula paxillus
Zemitrella choava
Macrozafra saxatilis
Cominella adspersa
Cominella maculosa
Cominella glandiformis
Cominella virgata
Buccinulum vittatum
Penion adustus - largest 120 mm, Kohi-St Heliers reef
Taron dubius
Amalda australis - common in Mission Bay, alive
Amalda depressa - Mission Bay, alive
Amalda novaezelandia - Mission Bay, alive
Neoguraleus sinclairi
Epitonium tenellum - in drift
Philine auriformis - alive, near Bastion Point
Bulla quoyi - dead
Haminoea zelandiae - dead
Placida aotearna - collected by Bill Perks, Bastion Point 1933 as a new species, later described by Powell
Rostanga rubicunda - St Heliers reef
Dendrodoris citrina
Dendrodoris gemmacea - on one occasion, on Kohi wharf piles, two specimens

Onchidella nigricans
Siphonaria zelandica
Amphibola crenata
Laoma leimonias - Orakei bush
Delos coresia - Orakei Bush
Flammulina parva - Orakei Bush
Flammulina olivacea - Orakei Bush
Flammulina chiron - Orakei Bush
Egestula egesta- Orakei Bush
Phrixgnathus conella - Orakei Bush
Nucula hartvigiana
Solemya parkinsoni - dead
Peora canaliculus - large, off Kohi wharf
Modiolarga impactus - around wharf piles
Lithophaga truncata
Atrina zelandica
Chlamys zelandiae
Lasaea maoria
Mactra ovata
Paphies australis
Paphies subtriangulata - dead, single valves
Tellina liliana
Tellina gaimardi
Soletellina nitida
Dosinia subrosea
Notopaphia elegans
Dosinula zelandica
Chione stutchburyi
Paphirus largillierti
Notirus reflexus
Barnea similis
Pholadidea spathalata
Myadora striata - Mission Bay tidal flat
Offadesma angasi - several wash-ups on reef area between St Heliers and Kohimarama

David H Baker
2nd May 1997

CHARLES REED LAWS

By Nancy Smith.

When the Auckland Museum marine department was recently under threat of closure, it was visited by Jocelyn Laws, come to look at her father's molluscan collection for fear it would be lost to the people of Auckland. That threat has been averted for the meantime but Jocelyn's visit was one more reminder of the precious heritage of marine natural history that was put in jeopardy by management unable to understand its importance.

252 of the primary type specimens in the collection are of Laws authorship, and hundreds of specimens of recent and fossil molluscs are from his collections.

Born in Auckland in 1894, Charles Laws was educated in Dunedin and Christchurch. He did very well at school both academically and on the sports field but left in 1911 for a successful teaching career which he did for the rest of his working life except for a spell in Egypt and France during World War 1. While teaching he studied at Auckland University and was the second ever student to undertake a geology thesis there. For this he won the Julius von Haast prize awarded by the University of London. In 1921 Charles married Evelyn Katie Lee and in 1925 twin daughters were born, followed in 1933 by a son.

Charles Laws was encouraged in the study of molluscs by Harold Finlay ("Poirieria vol.17, no.3) and Jack Marwick. He published many molluscan papers almost all on the systematic study of our Recent and Cainozoic mollusca. At a time when micromolluscs were largely ignored Laws studied them and together with Finlay and Powell opened a new field of information on a fauna important to both the study of molluscs and biostratigraphy. He contributed a great deal to the cataloguing of our fauna and despite the continuing revisions of the taxa his work is still generally accepted as valid.

For years Laws collected and studied Tertiary and Recent members of the *Pyramidellidae*, minute gastropods common in New Zealand. He submitted his review in 8 papers between 1936 and 1940, to the Royal Soc. classifying the thousands of specimens he had examined by microscope into 191 species and subspecies in 34 genera, many described as new. Today 52 of our recent and most of our 70 odd fossil pyramidellid names are ascribed to Laws. This work on the Pyramidellidae gained him his DSC in 1935. In 1950 he was elected to Fellowship of the Royal Society of New Zealand in recognition of his contributions to paleontology.

Dr Laws did most of his own field work, paid for out of his own pocket and he drew on his personal collection for material for university classes. He scoured the countryside with backpack and bicycle, until he sold his first collection to the Auckland Museum.This enabled him to buy a car which was a great pleasure to his young family and aged parents.

Laws continued with his work and made a second collection from which he sold the 300 odd types and c.400 paratypes to the NZ Geological Survey, 2463 named NZ spp. and 3000odd overseas spp. to the Smithsonian Institute and a small residue to the Auckland University. Into his sixties he still went into the field to check finds and ran an annual field camp for students.

After he retired in 1959 Charles Laws devoted himself to his family and his hobbies. He loved his garden where he grew wonderful roses, carnations and chrysanthemums. There were always bowls of flowers in the home. Photography, home brewing and fishing on the Manukau with his son occupied his time for the remainder of his life. "Everything he did he did well - but the fishing was not very successful!" says Jocelyn. Charles and his wife Evelyn were very happily married for 63 years and his family say "He and Mother were good companions and fun to be with". Charles Reed Laws DSc (NZ), FRSNZ died in 1985 but his memory lives on in the many species he described, and about 20 named for him.

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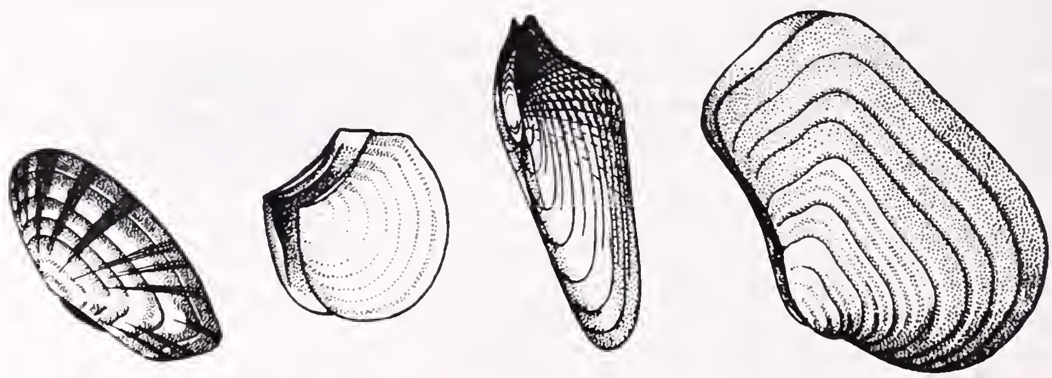
Laws, Jocelyn, pers.comment.

PERIODICALS:-from Nancy Smith

BASTERIA Vol.61, No1-3, pp1-72
"The morphology and assignment of *Pseudohinnites levii* Dijkstra,1989 (Bivalvia: Pectinoidea) by H.H.Dijkstra and J.Knudsen"
A record of the bivalve *Guianadesma sinuosum* Morrison from the central Amazon basin (Bivalvia: Coebulidae) A.Leistikow & R.Jansen.
Two articles on Cerithiopsidae from the Miocene of Belgium by R.Marquet.
Acrosterigma sewelli (Prashad,1932) a valid species from the central Indo-Pacific, compared with *Acrosterigma flava*(Linnaeus,1758) (Bivalvia: Cardiidae) by J.J.Ter Poorten.
Two articles by A.J. de Winter on land snails: including photos of an *Achatina* 213mm x 124mm.
More on landsnails: *Oxychilus* from Giusti & Managnelli, Molluscs of Bali from J.J.Vermeulen.
Opishobranchia of the genus *Chelidonura* Adams,1850 (Cephalaspidea) from the Isle of Malta. A.S.Perrone & C. Sammut.
Book Review by Th.C.M.Kemperman:- David G. Reid, 1996
"Systematics and Evolution of Littorina." Kemperman says "This work will be a great help for both shell collectors and professional malacologists....a superb and up to date... very readable book....an absolute must..."

APEX VOL 10 (4) 20 DEC. 1995

Conus bahamensis n.sp., a name for an elusive cone by D.L.N. Vink and R. Rockel.
Chronological analysis of the *Conus gradatus* complex (Gastropoda,Prosobranchia,Conidae), with the rediscovery of the holotype of *Conus scalaris* Valenciennes,1832 by J.M.Lauer.
Pterymarchia n.gen. and *Vaughtia* n.gen., two new muricid genera (Gastropoda, Muricidae: Muricinae & Ocenebrinae)



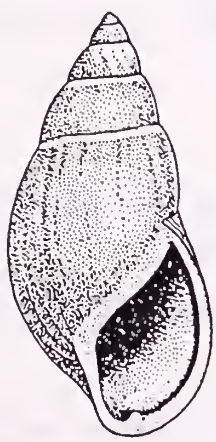
-----and I'll blow your little landsnail house down. We all know the feeling don't we. When visiting small *Land Snail* we have to watch our heavy breathing and if, perchance, we feel a sneeze coming on hurry quickly outside. For when Tane acceded to *Marine Snail's* long held desire to climb beyond the high tide mark and explore the land he imposed a penalty. 'From henceforth you will only have a temporary home, one made of "sticks".' And *Land Snail* agreed but in the nature of things never stopped secretly trying to beat Tane's edict and only ever partly succeeding, for who can defy the Gods.

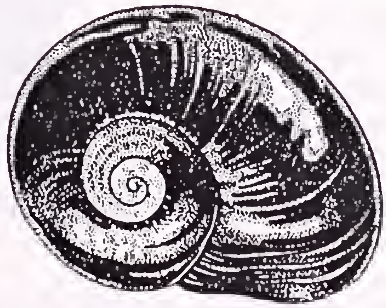
Calcium carbonate was the substance *Land Snail* discovered it could utilise to strengthen its house and in some places Tane had freely supplied it. Around the coast spray drift from the old environment supplied some and at other places great outcrops occured naturally and this could simply be absorbed. It wasn't nearly as good as the building blocks that could be made from the sea soup but it was better than nothing and *Land Snail* gobbled it gratefully and at least managed a house of "clay".

She (*Land Snail* is sometimes he and she but I will only only mention the most important part) developed all sorts of wiles to obtain and preserve this calcium; crudely, by simply eating other snails, house and all, and robbing them of their reserves; cunningly, by eating plants which had better ways of obtaining it; cleverly, by developing glands in her tail which can dissolve the old shells and absorb their calcium; and considerately, by laying her eggs in her umbilicus and allowing her young to scrape off some of her reserves before leaving the "nest".

Nowdays *homo sapiens* has provided some rich pickings. Before sophisticated rubbish disposal heaps of leftover calcium rich food thrown under the trees supplied rich grazing for *Bush Snail*. Jim Goulstone himself supplies the calcium carbonate to *Land Snail* in many ways; on his garden as fertilizer, on his concrete paths after rain and on his glasshouse sunshield. Not that she is grateful either for she eats all his cabbages but she does bestow some beautiful artwork on his glasshouses where she grazes the lime sunshield.

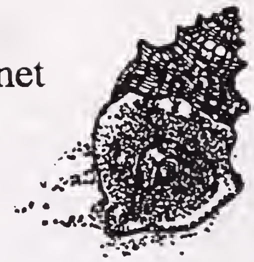
But Tane still has the last word. *Land Snail* remains with no real past and when *Marine Snail* is going on about her structures in the Palaeozoic she can only yawn, though delicately you understand, for she doesn't want to self destruct.





Conchology on the Internet

by Zeb Ahmed.



As this is the first time I have done something like this I'm not exactly sure *what* is expected of me! But, with support I am sure I shall improve. Being so new to conchology, I have found it extremely difficult to get books and information on molluscs, and so, therefore, I turned to the Internet[1].

The Internet is *not* difficult and it's potential is immense. Finding information etc from it is as easy as 1 2 3! (I'll be happy to help anyone with no prior knowledge of the Internet to get started if interested.)

As I was searching for information on shells I found, quite to my dismay, that there was practically *nothing* on New Zealand Mollusca! This I intend to rectify by creating a homepage[2] solely dedicated to NZ shells. I know that such a page, once operational, will be appreciated not only by New Zealand enthusiasts, but also other collectors from around the world. As I am still fairly new to the New Zealand land and marine fauna, I would *very* much appreciate help from those more experienced!

I have already created a homepage that deals with shell images/graphics/artwork etc, and anyone interested may view it at:
http://members.tripod.com/~millarca/astraea.html

For now, anyone needing information on shells/molluscs, *please* approach me on the matter and I will be *very* happy to search for the information you need.
There is a visual feast of shells on the Internet and I highly recommend to anyone interested in the aesthetic beauty of shells, to take advantage of my page and the pages of others, whose addresses have been included.

Some excellent sites on the Internet:

-*Conchology Guide* at :
http://www.club.iinet.be/~year0078/
About: has 2,500 images to consult from; 50,000 scientific names with authors and date and range; 3,500 type specimens indicated; 390 other shell links.... an *excellent* site.

-*Mollusc Image Links* at:
http://habanero.cb.uga.edu/GSC/images.html
About: collection of links to some very good shell images + an excellent program for modelling seashells.

-*Mollusca* at:
http://www.molluscs.net/
About: links to shell clubs & organisations; book dealers; shell dealers; there is an on-line chatroom where you can make friends and exchange!

Contact: Zeb Ahmed *Ph:* (09) 627 1392 *Email:* zeb_ahmed@hotmail.com

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[1] a collection of thousands of computer networks around the world which are linked together.
[2] is a term used to refer to a main or front page of a site - basically the front cover of a book!

POIRIERIA TWENTY YEARS AGO

Nancy Smith

In October 1977 the club held a field trip to Ngungaru, which drew 18 members. They apparently had a very successful weekend but did not find even one *Morula chaidea* in Pacific Bay where there had been quite a few living on the undersides of the rocks previously. As well as sea shells land and freshwater shells were searched for and listed.

Those of you who are struggling with so many name changes in Spencer & Willan might note that 20 years ago we were being told that *Estea* should be changed to *Pisanna*. Powell either missed or disagreed with this bit of information, or we would have had that one firmly fixed in our brains by now.

On the subject of name changes, an article on our oysters uses only one binomial *(Crassostrea gigas)* that appears unchanged in Spencer & Willan! This of course is an introduced species having been first recorded in 1971.

"Bullina from Northern N.Z." by N.W. Gardner mentions that this popular genus was studied by Rudman in 1971 and listed under the 4 genus names as given in Powell. Norm gives a little more description than Powell, with drawings to clearly point up the differences. Powell says that further study may prove that all 4 species are variations on *B.lineata*. The interesting point is that Spencer and Willan have found no more information on this genus in N.Z. Anyone who has collected various forms of the shell might like to follow up Rudman 1971 and see if they can throw any light on the matter!

Two immigrant landsnails were remarked on; *Vertigo pygmaea* had become established while *Lauria cylindracea* was recorded for the first time.

APEX

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CONTENTS

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All other correspondence should go to: The Secretary, Mrs M Town, 9 Otakau Rd. Milford, Auckland New Zealand.

An authentic record of *Neothais clathrata* (A. Adams, 1854) in New Zealand

by Richard C. Willan

In April 1997, Fiona Thompson collected a small white whelk alive on the undersurface of a stone at low tide at Dog Island in the Parengarenga Harbour, Northland. The shell was immediately recognised as belonging to a species not previously known in the New Zealand molluscan fauna. The shell, which was passed to me for identification, is now deposited in the mollusc collection at the Auckland Institute and Museum under the registration number AK 138400.

The species belongs to the Indo-west Pacific species called *Coralliophila clathrata* (A. Adams, 1854) in most recent literature (Kira 1962, Trondle 1989, Wilson 1994). The most comprehensive description is that by Robertson (1980) and this account includes information on the ecology, feeding and reproduction of this muricid. The species is apparently rather widespread, ranging from Zanzibar to French Polynesia, but never common. I have collected single specimens in Vanuatu and Hibernia Reef in the Timor Sea.

In the tropics, the species is an obligate symbiont of the zoanthid *Palythoa* sp., generally remaining just beneath the edge of a colony. Robertson (1980) concluded it had a remarkable diet, feeding solely on the nematocysts (stinging cells) that are present within the mucous shed by this cnidarian. Robertson found neither feeding scars left on the *Palythoa* colony nor sand grains in the faeces. Since no species of *Palythoa* occurs in New Zealand, Fiona's specimen must have been utilising some other species of zoanthid as food.

The shell (Figure 1) of Fiona's specimen is 15.0 mm high and 10.1 mm wide, thus it is smaller than the maximum size of 21.5 mm recorded by Robertson. The shell itself is corroded so the lattice-like sculpture characteristic of this species (Figure 2) is somewhat obscured. Nevertheless, the following details can be seen clearly; ovate shape; 5½ broadly convex shouldered whorls; well-defined suture; axial sculpture of 14 strong broad ribs extending with undiminished strength from the suture to the siphonal fasciole; spiral sculpture of 5 strong broad rough equally spaced primary cords, the strongest (the second) occurring on the shoulder, plus weaker secondary cords between all the primary ones; the spiral cords expand where they cross the axial ribs but do not form nodules; deep pits occupy the interspaces between the axial ribs and primary spiral cords; crenulate outer lip with varix externally and about 10 short denticles internally; single weak parietal callus; narrow umbilicus; shallow siphonal notch, chalky cream exterior; uniformly white aperture.

Shell collectors in the southwestern Pacific Ocean now must be aware of the possibility that this species could be found in their areas and be ready to separate them from other similar-looking muricids, particularly *Neothais smithi* and *Morula chaidea* (Duclos, 1832). *N. smithi* (Figure 3) grows larger (to 25 mm in length), is

more slender, and has much weaker axial ribs that result in the absence of latticed sculpture. Instead the ribs are strongly nodulose where they intersect the spiral cords. *M. chaidea* (Figure 4) is similar in size (to 15.5 mm in length), but is more slender, the axial ribs are crossed by 9 or 10 cords, there is a single broad spiral cord immediately below the suture and the outer lip is straighter.

The placement of this species into a genus and family are actually more challenging than the specific identification. Currently it is located in the genus *Coralliophila*, but Wilson (1994: 17) queried its placement there. Quite rightly. The spiral cords are continuous and rough, not composed of rows of regular, coarse, hollow scales as in *Coralliophila.* The apertural denticles are short and confined to the outer part of the outer lip, not fine lirae that extend deep into the aperture as in *Coralliophila*. Thirdly, the animal crawls actively, whereas species of *Coralliophila* are sedentary in their natural habitat and in the laboratory. Other species of *Coralliophila* are normally intimately associated with scleractinian ("true" reef building) corals, of which, there are none in New Zealand. The sculpture of this species is unmistakably like that of *Neothais smithi* (Brazier, 1889). Walter Cernohorsky (1986: 45) recognised this when he identified my shell from Vanuatu as *Neothais rugulosa* (Pease, 1868). This name (originally *Sistrum rugulosum*), as well as *Coralliophila sugimotonis* Kuroda, 1931, are herein considered junior synonyms *of Neothais clathrata* (A. Adams). Therefore, I have placed this species in the genus *Neothais* along with *N. smithi* from the southwestern Pacific Ocean, *N. harpa* (Conrad, 1837) from Hawaii and *N. nesiotes* (Dall, 1908) from Easter Island. The only problem at once evident with this placement is that a radula exists in *N. harpa* and *N. nesiotes* (Rehder 1980), but none could be found in *N. clathrata* (Robertson, 1980). On the basis of the diet and development, *Neothais* should apparently be transferred into the Muricidae: Coralliophilinae. This solves the difficulties evident in its present placement because it does not conform to either the Ocenebrininae or Rapaninae as distinguished and defined by Kool (1993). Therefore a summary of the nomenclature, classification and synonymy for this species as I interpret them are:

Family Muricidae: Subfamily Coralliophilinae
***Neothais clathrata* (A. Adams, 1854)**
Primary synonyms: *Rapana clathrata* A. Adams, 1854; *Sistrum rugulosum* Pease, 1868; *Coralliophila sugimotonis* Kuroda, 1931.

Neothais clathrata cannot be added to the New Zealand molluscan faunal list (Spencer & Willan 1996) on the basis of this single specimen because it could be the result of the chance settlement of a long-distance larva. The larvae of this species have been confirmed as being planktotrophic (Robertson 1980). Robertson estimated that the larval life of this species lasted about a month and possibly longer.

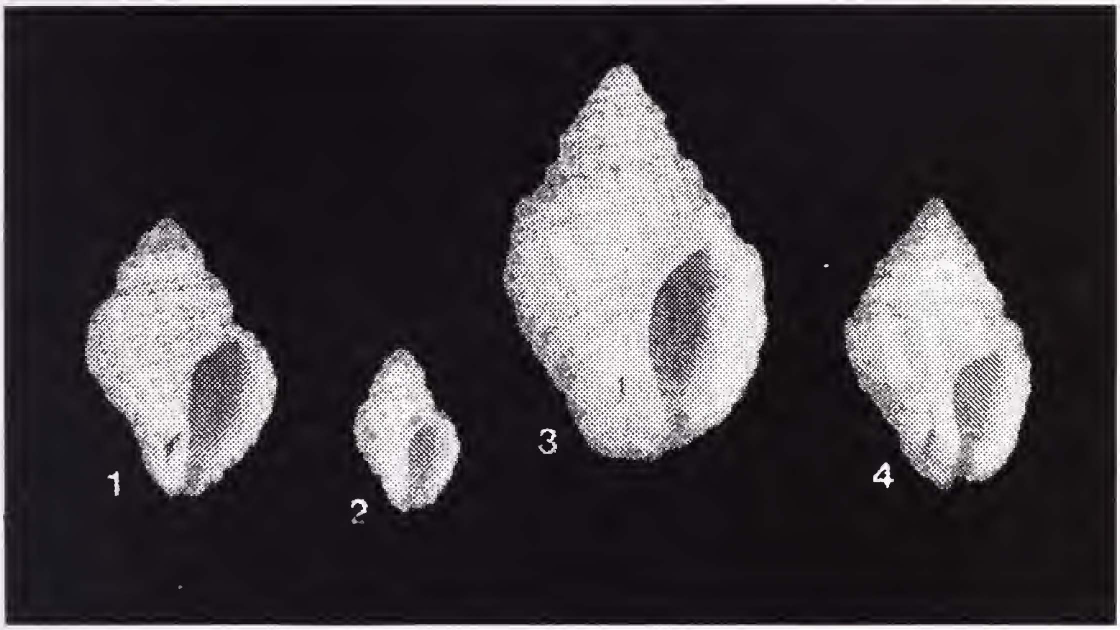

Figure 1: *Neothais chathrata*, 15.0 mm, Parengarenga Harbour, New Zealand, Auckland Institute and Museum AK 138400. **Figure 2**: *Neothais clathrata*, 8.9 mm, Hibernia Reef, Timor Sea, Museum and Art Gallery of the Northern Territory (NTM) P7531. **Figure 3**: *Neothais smithi*, 21.2 mm, Norfolk Island, NTM P8285. **Figure 4**: *Morula chaidea*, 15.9 mm, Hastings Point, northern New South Wales, Australia, NTM P10282.

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MOLLUSC SURVEY BEACHLANDS and MOTUKARAKA ISLAND

by Margaret Morley, Jim and Gladys Goulstone, Bruce Hazelwood, Betty Headford, Nancy Smith, Rae Sneddon, Annwyne Standish and Joan Willan

Summary

Eighty seven marine mollusca (6 chitons, 45 gastropods, 36 bivalves) and 8 land mollusca are recorded from Beachlands and Motukaraka Island (Flat Island), east of Auckland. Most of these species were found by the authors on a Auckland Museum Conchology Section field trip on 20 September 1997. A few species found at Beachlands on previous occasions have been included.

Although molluscs are the primary focus other phyla, as they were encountered, are also recorded.

Introduction

The Beachlands area was chosen for a survey because its organisms have been placed under threat by the application for resource consent to dump annually 3000 cubic metres of muddy sediments into water only 2m deep south west of Motukaraka (Fig. 1). The management of Pine Harbour Marina need to dredge this material from the entrance channel, but concerned local residents and environmental groups were dismayed with the plan to dump muddy slurry in shallow water so close inshore. Submissions and objections at the hearing on 29 April 1997 had to rely on anecdotal evidence on the diversity and quantities of marine life in the area. The Marina employed Professor Healy of Waikato University, who produced much data indicating that the dumping would have no negative long-term effects.

The consent was granted for one year and a monitoring programme put in place. There will be reviews before subsequent dumping is allowed. Dredging and dumping started in September 1997 (Pat Cook pers. comm.).

The survey

The beach was accessed from the track in Hawke Cresent, Beachlands. The intertidal area was searched from the splash zone down to low water. We had perfect collecting conditions with a fine day and a low tide of 0.2m. The low tidal reef to the east of the island was included. Some members walked round Motukaraka at beach level while Jim collected land molluscs on the island.

Effect of silt on species

A layer of silt was noted on the surface of the intertidal area, this was not present some years ago. There has also been a loss of sand and coarse fractions. (Joan Willan pers. obs.). Pat Cook, a resident of Beachlands, first noticed a build-up of silt during the excavations for the Pine Harbour Marina in 1986-7 and more recently during the development of the adjacent Formosa golf course.

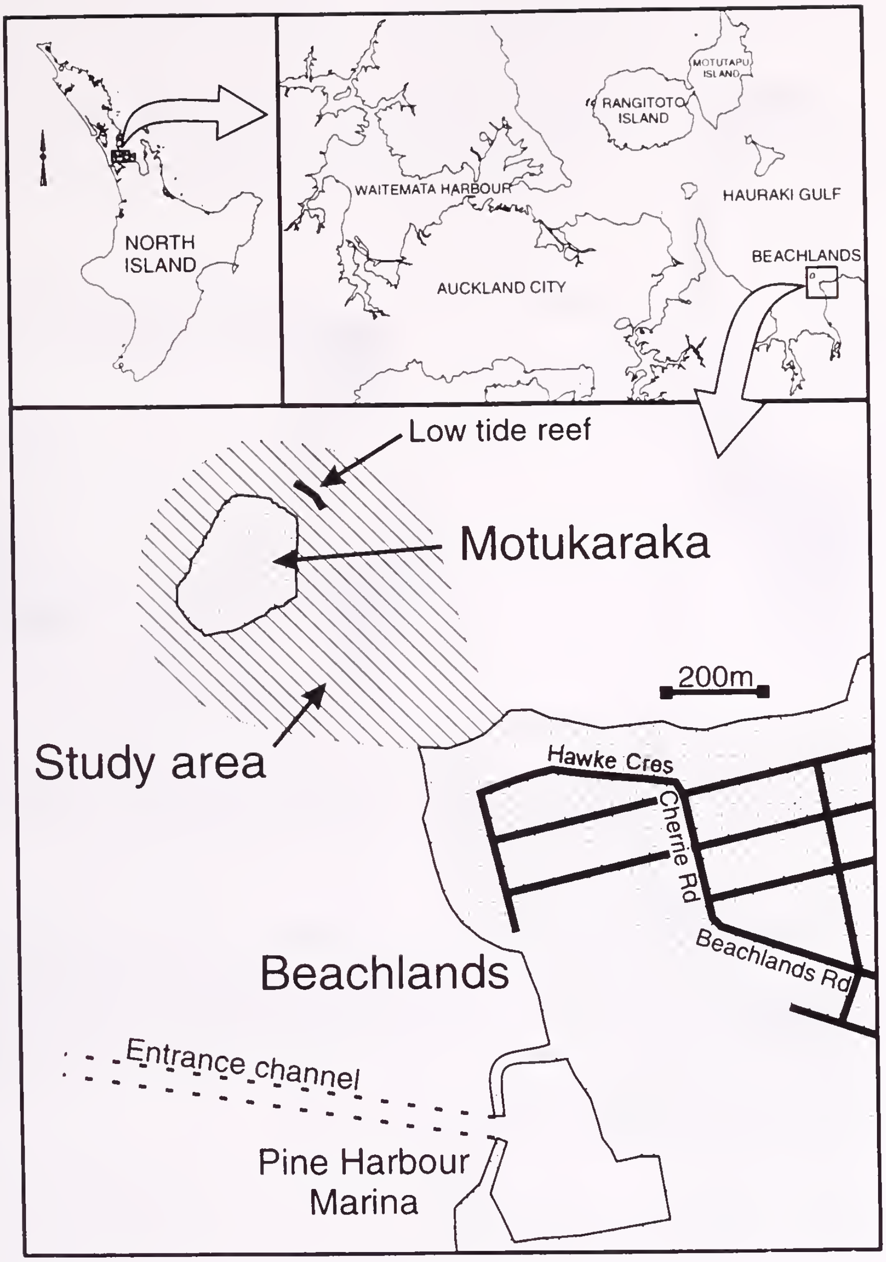


Fig. 1 Beachlands and Motukaraka to show study area

Silt is destructive to habitat and poorly tolerated by many species, eg cockles *Austrovenus stutchburyi* covered by deep silt would die. Three species of rock borers are present *Barnea similis, Pholadidea suteri* and *P. tridens* (Fig. 2). Although not looked for during this survey, the commensual bivalve *Arthritica crassiformis* which lives with *B. similis* has been found at Beachlands on a previous occasion. The rock borers are unable to move and would die if their siphons became buried in silt.

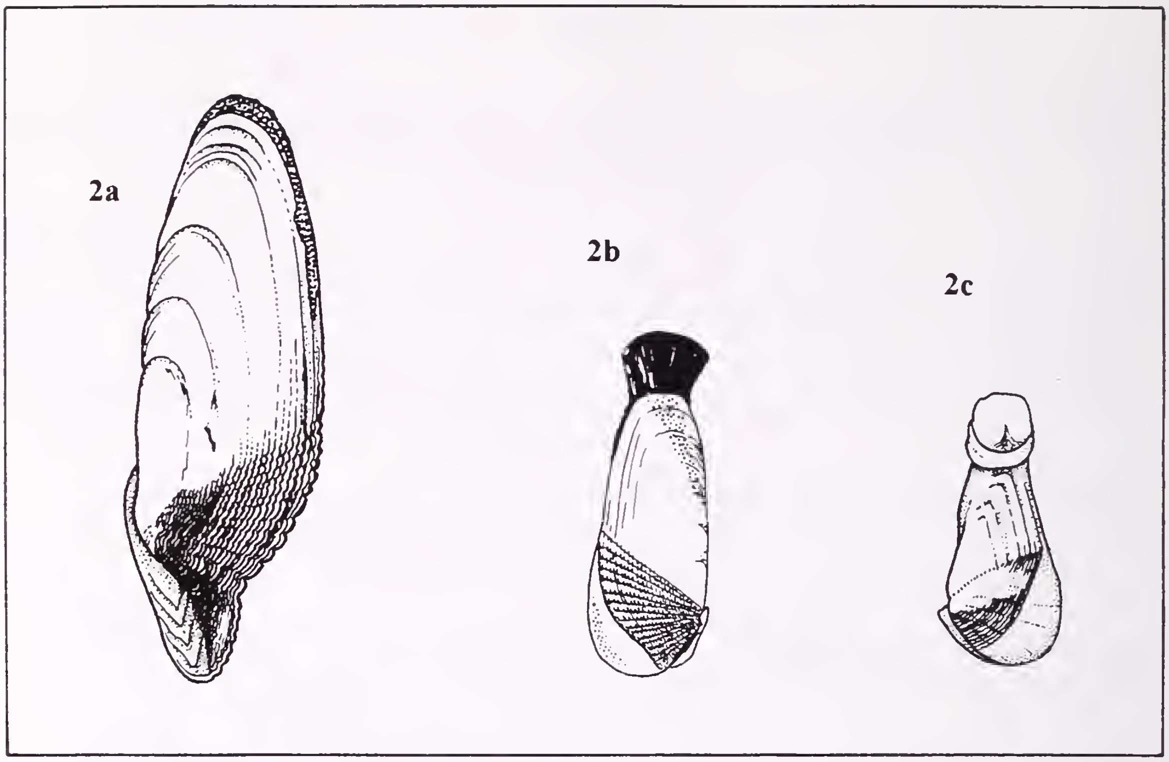


Fig. 2 2a. *Barnea (Anchomasa) similis* Gray, 1835 Length 75mm **2b**. *Pholadidea suteri* Lamy, 1926 Length 45mm **2c.** *P. tridens* (Gray, 1846) Length 25mm

Many colourful sponges are present at and below low tide such as the orange golf ball sponge (*Tethya aurantium*). Sponges cannot tolerate much silt. *Rostanga rubicunda,* the small, bright red sea slug feeds on red sponges. The small black slug *Melanochlamys cylindrica* (Fig. 3) is common, especially on the low tidal reef. The side gilled sea slug *Pleurobranchaea maculata* is also present. These three opisthobranchs would also die because silt clogs their gills (Richard Willan pers. comm.).

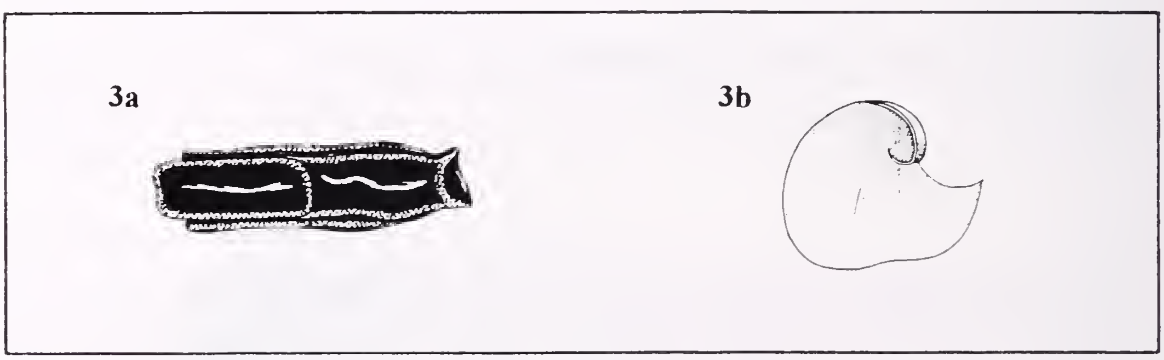
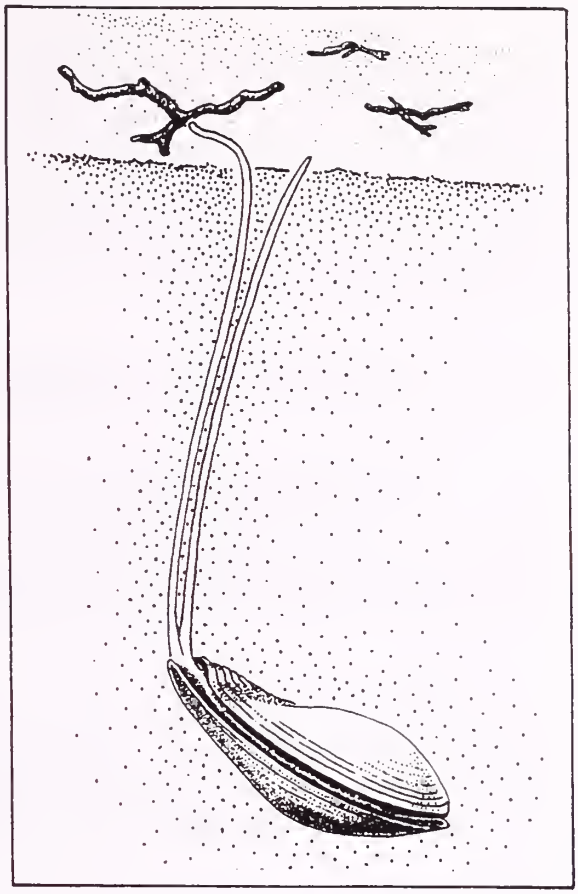


Fig. 3 *Melanochlamys cylindrica* (Cheeseman, 1881) **3a** animal Length 30mm
3b internal shell Height 6mm

Cockles live at mid tidal level in sandy mud. These are small, averaging 15-20mm in length. Many juvenile pipi *Paphies australis* are present, there are only a few scattered mature specimens. Patches of green lipped mussels, *Perna canaliculus* cling to low tidal rocks. All these species are subject to heavy collecting by humans as well as being stressed by habitat degredation. The introduced Pacific oyster *Crassostrea gigas* is common on mid to low tidal rocks. This species appears to be extremely tolerant of silt.

Fig. 4 *Macomona liliana* (Iredale, 1915)



Judging by the dense characteristic "birds foot" marks on the sand, wedge shells *Macomona liliana* (Fig. 4) are living intertidally in large numbers. Although they can live in mud, they would be stressed or killed by large quantities of silt suddenly settling over them. Thousands of little black mussels *Xenostrobus pulex* pack tightly together on the rock platform. These species are less likely to be collected by people for food. It is important to note that all bivalves play an key role in keeping the water clean by filtering and as food for fish and birds.

Three grazing top shells *Melagraphia aethiops, Diloma subrostrata* and *Micrelenchus tenebrosus* are common intertidally. There are also many small limpets *Notoacmea helmsi* attached to dead shells on the surface of the sand. These would easily be smothered with silt. Other top shells such as *Trochus viridus* live on seaweeds. Many micromolluscs also live here, but are only discovered by washing the seaweed and looking at the residue under a microscope. Common amongst these are dark *Eatoniella olivacea.*

Four carnivorous whelks *Cominella adspersa, C. glandiformis, C. virgata* and *C. maculosa* scavenge and predate on other shellfish. Numerous horn shells *Zeacumantus lutulentus* crawl over the soft surface eating the nutritious mud as they go.

Many species of seaweeds grow in the study area. Neptunes necklace *Hormosira banksii* is common across the intertidal sandstone platform, together with a finer textured

olive green seaweed *Microcoleus lyngbaeus*. The large brown seaweeds are prolific at and below low tide.

Other marine life includes green anemones *Isactinia olivacea*, flat worms, a variety of crabs mostly under rocks, several large warty sea cucumbers, hundreds of snapper biscuits, shrimps, young flounder and small rock fish. Oyster catchers feed on the shore.

LAND MOLLUSCA

The native species *Phenacohelix giveni, Mocella eta, Phrixgnathus* cf. *ariel, Delos coresia* and *Climocella* sp were collected from a vertical piece of cliff near the Hawke Cresent track, where there is a tiny area of maidenhair fern. The single, dead specimen of a *Climocella* species is one that Jim has not seen before, so he is keen to collect more for further study. Unfortunately one of the only likely habitats is vegetation on the cliff adjacent to the sampled area, but collecting here needs ropes and a good head for heights! Any volunteers?

The introduced species *Oxychilus cellarius*, and the slugs *Milax budapestensis* and *Deroceras reticulatum* are present in large numbers all over Motukaraka.

A tree planting programme is underway for the island being co-ordinated by Joan Willan. It would be nice to visualise the native snails recolonising the restored bush, but this will not happen because of the well established populations of the introduced land molluscs, especially the omnivorous *Oxychilus cellarius.*

Discussion

This area, while not so rich as it once was, still has a diverse fauna worthy of our consideration and protection. Opponents to future resource consent to dump dredgings so close inshore will have a species list to support their case. It may be considered useful to repeat this survey in a year's time or maybe do a quantitative survey.

Acknowledgements

We thank Richard Willan for help to prepare the manuscript and providing additional information on the species at Beachlands, Bruce Hayward for suggesting improvements to the manuscript, Hugh Grenfell for drafting the computerised map (Fig. 1) and Pat Cook for the history of the local environment.





BEACHLANDS & MOTUKARAKA ISLAND

Chitons	alive	dead
Acanthochitona zelandica	*	
Chiton glaucus	*	
Cryptoconchus porosus	*	
Ischnochiton maorianus	*	
Leptochiton inquinatus	*	
Sypharochiton pelliserpentis	*	

Gastropods		
Amalda australis	*	
Amphibola crenata		*
Anabathron hedleyi		*
Buccinulum linea	*	
Buccinulum vittatum	*	
Bulla quoyii		*
Chemnitzia sp.		*
Cominella adspersa	*	
Cominella glandiformis	*	
Cominella maculosa	*	
Cominella virgata	*	
Crepidula costata		*
Crepidula monoxyla	*	
Dicathais orbita	*	
Diloma subrostrata	*	
Eatoniella lutea	*	
Eatoniella olivacea	*	
Eatonina atomaria	*	
Eatonina micans	*	
Haminoea zelandica	*	
Haustrum haustorium	*	
Lepsiella scobina	*	
Maoricolpus roseus	*	
Melagraphia aethiops	*	
Melanochlamys cylindrica	*	
Micrelenchus tenebrosus	*	
Murexul octogonus	*	
Nodilittorina antipodum	*	
Notoacmea helmsi	*	
Onchidella nigricans	*	
Penion sulcata		*
Pisinna impressa		*
Pisinna zosterophila	*	
Pleurobranchaea maculata	*	
Rostanga rubicunda	*	
Scutus antipodes	*	
Sigapatella novaezelandiae	*	
Siphonaria australis	*	
Struthiolaria vermis		*
Trochus viridus	*	
Turbo smaragdus	*	
Xymene plebeius	*	
Zalipais lissa	*	
Zeacumantus lutulentus	*	
Zeacumantus subcarinatus	*	

Bivalves		
Anomia trigonopsis		*
Arthritica bifurca		*
Arthritica crassiformis	*	
Atrina pectinata zelandica		*
Austrovenus stutchburyi	*	
Barnea similis		*
Cleidothaerus maorianus		*
Crassostrea gigas	*	
Cyclomactra ovata		*
Dosina zelandica	*	
Dosinia subrosea		*
Felaniella zelandica		*
Irus elegans	*	
Irus reflexus		*
Limaria orientalis		*
Macomona liliana	*	
Modiolarca impacta		*
Musculista senhousia		*
Musculus impactus		*
Myadora striata		*
Neolepton antipodum	*	
Nucula hartvigiana	*	
Ostrea aupouria	*	
Paphies australis	*	
Paphies subtriangulata		*
Pecten novaezelandiae		*
Perna canaliculus	*	
Pholadidea suteri	*	
Pholadidea tridens		*
Pseudoarcopagia disculus		*
Ruditapes largillierti		*
Saccostrea cucullata	*	
Soletellina siliquens		*
Theora lubrica	*	
Xenostrobus pulex	*	
Zelithophaga truncata		*

Land Mollusca		
Climocella sp.		*
Delos coresia		*
Deroceros reticulatum (slug)	*	
Milax budapestensis (slug)	*	
Mocella eta		*
Oxychilus cellarius	*	
Phenacohelix giveni		*
Phrixgnathus cf. ariel		*

Other Phyla		
Echinoderms		
Evechinus chloroticus	*	
Fellaster zelandica	*	
Fish		
3 fin fish	*	
flounder	*	

Algae		
Carpophyllum spp.	*	
Codium convolutum	*	
Codium fragile	*	
Colpomenia sp.	*	
Ecklonia radiata	*	
Hormosira banksii	*	
Microcoleus lyngbaeus	*	
Sargassum sinclairii	*	
Sponges		
Ancorina alata (black sponge)	*	
purple sponges	*	
red sponges	*	
Tethya aurantium	*	
Tethya ingalli	*	
Worms		
Pomatotoseros caeruleus (tube worm)		
scale worm	*	
flat worm	*	
Holothurian		
Stichopus mollis	*	
Crustacea		
crabs	*	
shrimps	*	
other crustaceans	*	
Anemones		
Isactinia olivacea	*	

POIRIERIA TWENTY YEARS AGO

Nancy Smith

On 21st and 22nd January 1978 the Conchology Section held its first ever shell show! The first in New Zealand according to Richard Willan who wrote a full report for "Poirieria". Shellers came from as far as Whangarei and Christchurch bringing prize winning specimens with them. Approximately 1200 visitors saw the 150 entries displayed in the North Shore Teachers College Caf.(sic). The show was considered a great success.

On a less happy note, Crassostrea gigas was causing concern by its rapid spread and fast growth, although Idoubt the accuracy of "Specimens of up to 160 c.m. are not uncommon now." I guess they were 160mm and even that was a good size. The oyster was at that stage established in several areas around the northern shore of the Waitemata harbour and juveniles were quite common at Island Bay. The biggest specimens were round Mahurangi where they had escaped from the oyster farms,and (the late) Bob penniket had found a lrge single specimen on a rock on the Coromandel coast.

There is a list of the shells brought back from the Loyalty Islands with Joan Coles report on the club trip there in 1976, two articles on Limpets, and The Gardners made a list with comments on "Molluscs from the Channels of Parengarenga Harbour"

PS. Why don't you make yourself a collection of these fascinating old "Poirierias"? Most back numbers are available for next to nothing from Nancy Smith ph.4789915

PERIODICALS:-from Nancy Smith

APEX VOL 12 (2-3) 20 September 1997
The West African Muricidae.part 2.(completing the family) Ocenebrinae, Ergalataxinae, Tripterotyphinae, Typhinae, Trophoninae, & Rapaninae, by Roland Houart.
An English abstract follows the text in both parts. The species are illustrated with good clear b&w photographs.
Another paper on Oliva. Abstract " The shape of the shell of some Oliva species undergoes abrupt changes during growth. If undetected this often overlooked phenomenon can cause serious errors in the delimitation of morphospecies. Examples of non-isometric growth are reported and discussed." (Graphs only)

BASTERIA VOL.61,No.4-6, pp. 73-144 26-1-98
R.A.Bank & E. Neubert: Notes on Buliminidae, 5. (This includes Arabian systematics & a new species.)
A.C.van Bruggen: Vallonia costata (Muller, 1774) (Gastropoda Pulmonata)in South Africa, with additional notes on other alien species including Cochlicopa lubricella (Porro, 1838) in southern Africa.
Gerhard C. Cadee: Rissoa membranacea(J. Adams, 1800) from the Dutch Wadden Sea. This discusses the disappearance of R.membranacea along with the eelgrass Zostera marina which suffered from a "wasting disease", and the possibility of two different types of larval development within this one species.
D.F.Hoeksema: Note on the occurrence of Hydrobia acuta (Draparnaud, 1805) in Western Europe . "it will be demonstrated that H.minoricensis and H. neglecta fit completely in the conception of H.acuta"
J.van der Linden: The Metaxinae dredged by the CANCAP expeditions, with the new species Metaxia carinapex and Met axia hapax from the Cape Verde Islands (Gastropoda, Heterapoda: Triphoridae)
G.Manganelli & F.Giusti rediscribe Oxychilus mortilleti (Pfeiffer, 1859) (Pulminata, Zonitidae)
These articles are illustrated with black and white photographs and drawings.

LEVANTINA: We are sorry to say we have received our last exchange with Israel Malacological Society who have decided to cease publication of "Levantina" and "Argamon"
We do understand how difficult it is to keep these journals going, and wish them well.
This edition no. 83 January, 1998 has articles on;-
The slit and keyhole limpets of the red sea,
Coral spawning in the Gulf of Aqaba,
Beach drift at Elat, winter 1995
Rediscovery of Epitoniums in the Gulf of Aqaba, and an account of the events when Alan Roberts of Herzlia was stung by a scorpion fish, all by B.S.Singer.
H.K.Mienis has written on blister pearls found for the first time in Septifer excisus from the Red Sea and
shells collected during the North Sinai Archaeological Survey. There are photos, some coloured, some b&w, mostly of the Epitoniidae and slit limpets, and a nice colour snap of Scorpaena maderensis -the scorpion fish, which is better avoided even though it is good to eat! On a lighter note I. Yeruslavski describes a very novel mouse trap.

GLORIA MARIS arrived in a rush of 4 journals in 2 days.

Vol.35 (4-5): From 1989 to 1996 members of the Belgian Society for Conchology collected fossil molluscs at the Gulf of Aqaba and northern Red Sea.This edition lists the Conidae and illustrates them with the recent species, in colour photographs. A.Delsaerdt describes and names Conus eduardi n.sp. and asserts that Conus proximus cebuensis is not a forma but a subspecies.

Vol.35 (6), Red Sea Mollusca, commented and illustrated checklist, part 1. Family: Ranellidae.

A new species of Pustularia from the Philippines (Cypraeidae) by Guido T. Poppe & Philippe Marten ,

Pustularia jandeprezi sp.nov. with holotype, paratypes and comparable spp. illustrated in colour photography.

Vol.36 (1-2), Genus Nerita is continued (see G M vol.35 part 3).

Vol.36 (3).A.Delsaerdt describes another new Conus, this one from Thailand. Conus patamakanthini n.sp. is compared with C.australis, gabryae, etc

Red Sea mollusca part 2 is Cerithidae, and the General Conchology plate is Nassariidae:- Buccinanops and Dorsanum.

Reward for Procrastination.

For the past eigtheen months, 4 plastic grocery bags have been sitting reproachfully at my door, and finally I felt I'd better do something about them, to check whether anything worth seeing had long since disintegrated. To my great satisfaction in the several hours I spent going through the shell sand, a wide range of species in miniature were present.

Ranging from Murex octoganis, Astrea helioptera, Xenophora neozelandica, Acteon milleri, Balcis bulbula and a number of Uttleya williamsi. Amalda australis, A. nova zelandia and A.mucronata, , and Glaphrina vulpicolor were also there. There was even a minute penion still with its protoconch, as was an Alcithoe arabica. Quite a few Spectamen tryphenensis and Antisolarium egenum and Xymene Mortensen caudata and X. ambiguus. Both phenatoma were represented and Epitonium minora , Pervicara tristis, Pupa kirki and Tanea zelandica and Spendrillia as well. Lots of Cylincha thetidis, Emarginula striatula, Corbula zelandica, and Mirolenchus rufuzonus. And inevitably, the plethora of Venericardium purpurata , Dosina maoriana and Zeacoplis and Maoricoplis.

Proxiuba hulmei and P. australis and two paired Scalpomactra scalpellum added to the list

Though I didn't get time out on the beach this holiday, the sheer excitement of the richness dumped on Auckland's doorstep at Mission Bay was rekindled.

Fiona

VISIBLE EVIDENCE SERIES 6
Turridae: *Neoguraleus manukauensis* Powell, 1942

by Margaret S. Morley

Summary

The variability of *Neoguraleus manukauensis* is illustrated and records of extension of range provided.

Introduction

In 1989 I started a series of drawings of molluscs that are not illustrated in New Zealand Mollusca (Powell 1979) called Visible Evidence. The last in this series was number five (Morley 1993). The long interval has been caused by many pleasant diversions, but here is the sixth article in the series.

The specimen illustrated (Fig. 1) was kindly loaned to me by Richard Willan, who collected it freshly dead near Cornwallis wharf in the Manukau Harbour on 18 March 1975. It measures 10.8mm in height and 4.6mm in width. He also loaned for examination a total of 14 other dead taken specimens from the Manukau Harbour, including Mill Bay, Orua Bay, Weymouth and Kakamatua Beaches.

Description

Shell solid, with sagged whorls, greatest convexity below middle height. Axials heavy, flexuous, 8-9 per whorl. Colour dull brown to leaden, with a single white band encircling the lower half of the whorls (Powell 1979).

The following additional features are given in the original description (Powell 1942). Shell fusiform with a narrow base. Spire same height as aperture. Axials strong, blunt, distant, strongly arcuated by sinus, nine on body whorl, eight on penultimate. Spiral sculpture consisting of close, crisp threads, which cross the axials. About 12 weak linear spaced spiral cords on neck and fasciole. Sinus subsutural, canal moderate, long, open.

It is interesting to note that sagged whorls are not included in the 1942 description.

The holotype (Fig. 2; AK 71051) is a worn, dead specimen collected by Mrs Fairfield at Hillsborough, Manukau Harbour.

Variation

The proportions of the 16 specimens of *N. manukauensis* examined, show considerable variation from those with a medium spire height (Fig. 1) to those with a tall spire and sagged whorls (Fig. 3).

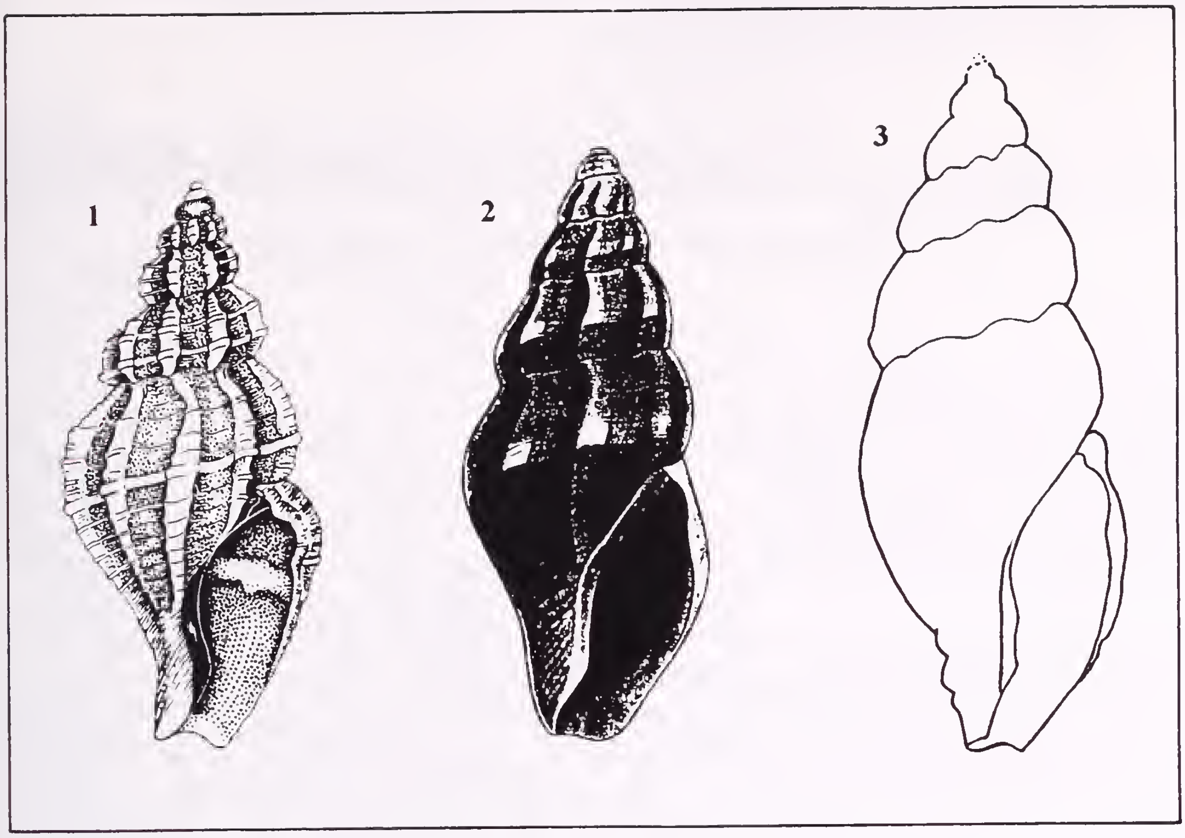


Fig. 1 *Neoguraleus manukauensis* Cornwallis specimen, Richard Willan collection
Fig. 2 *Neoguraleus manukauensis*, Holotype Auckland Museum collection (AK 71051)
Fig. 3 *Neoguraleus manukauensis* Outline of Herekino specimen, Morley collection

Extension of Range (Fig. 4)

This species has previously been recorded from Hillsborough and Orua Bay in the Manukau Harbour, west Auckland. The following specimens appear to be the first west coast records north of the Manukau Harbour.

1. Herekino Harbour

On 25 November 1994, I sieved a large, live specimen of *N. manukauensis* from low tidal mud at Owhata Beach, in the upper reaches of Herekino Harbour on the west coast of Northland. This is the first record of a live taken specimen. As well as being a new location this specimen exceeds the maximum measurements of height 12.5mm and width 5.0mm given by Powell (1979). The Herekino specimen has a height of 15.4mm and a width of 5.5mm. It's estuarine habitat has caused considerable erosion of the shell surface.

2. Kaipara Harbour

On 8 July 1972, Richard Willan found a specimen of *N. manukauensis* at Shelly Beach in the Kaipara Harbour. This specimen is also very large measuring 14.5mm in height and 5.7mm in width.

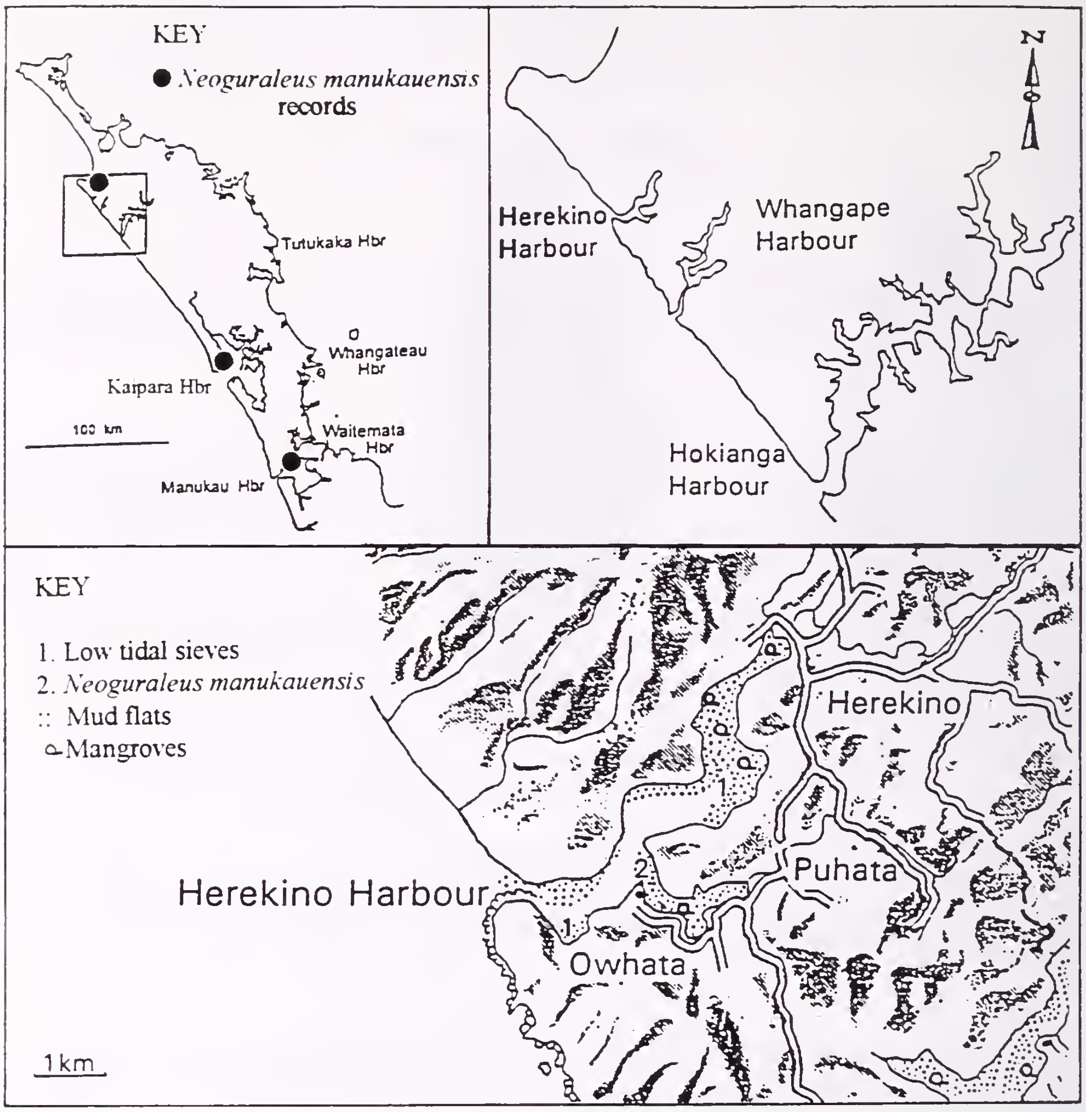


Fig. 4 Northern North Island, Manukau, Kaipara and Herekino Harbours

Endnote

Can any readers provide more information on *Neoguraleus manukauensis?* Other suggestions for drawings in this series welcomed, though it could be another 5 years before they are published!

Acknowledgements

Thanks to Richard Willan for loaning his specimens and Bruce Hayward for suggesting improvements to the manuscript.

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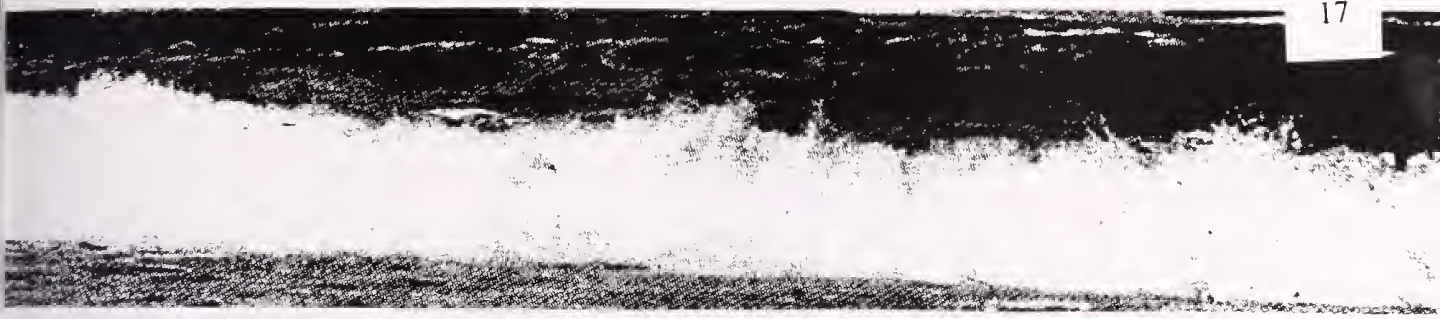


WATER, WATER, EVERYWHERE.

MICHAEL K.EAGLE

Seawater is the home of all marine creatures. Their survival depends, amongst other factors, upon seawater chemistry or the salinity inherent therein. All marine organisms, including mollusca, need energy for movement and food for growth. This is usually exemplified in carbon-based respirators by combining oxygen with sugars and proteins (Little & Kitching 1996). Benthic, often sessile, filter-feeding shellfish, obtain both these items from the surrounding seawater (Boaden & Seed 1992).

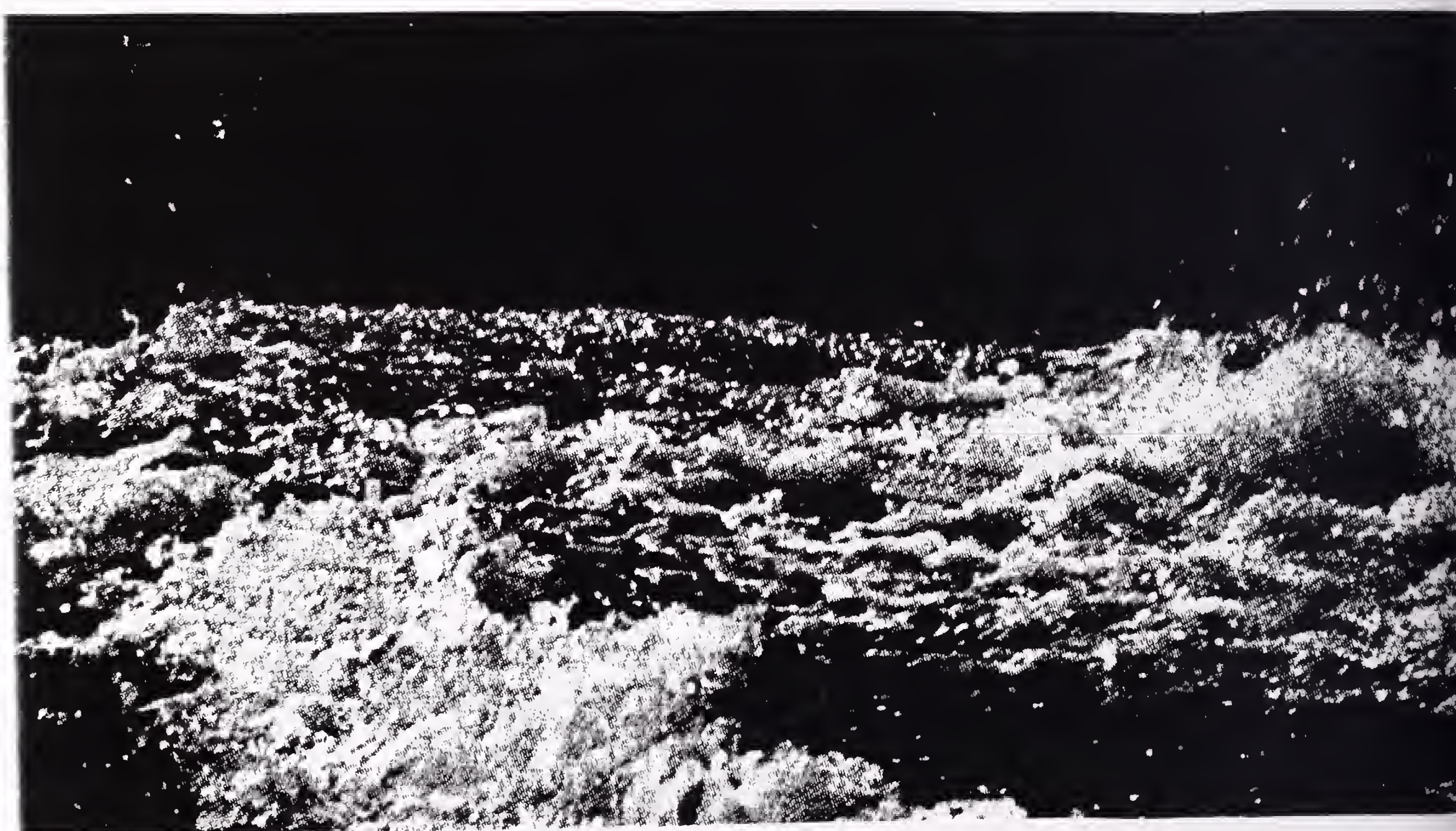
Although water and salt are the most common substances in seawater, they are only a few of the ingredients. Generally speaking, seawater contains about one half of the known elements, but most occur in only small, often minute, quantities. Experiments by Dittmar in 1884 aboard HMS Challenger's cruise proved that the major constituents of seawater samples collected from all the world's oceans are present in the same ratio as one another; meaning that the world's oceans are chemically very well mixed. A chemist can calculate the amount of all major seawater constituents if the most easily analyzed part, the amount of chloride ions, is made. This measure is the chlorinity of seawater, from which can readily be calculated the more important total salinity of a seawater sample.

Other than chemical analyzes, measuring a seawater sample's electrical conductivity can also determine salinity. Salinity is usually measured in parts per thousand parts of water with the average open-ocean water being 35 parts per thousand. Oceans and seas are constantly moving, circulating and mixing all their dissolved contents, keeping the composition of seawater relatively homogeneous. Regional processes, however, often make the seawater of one geographic area, different from that of another. Such differences occur around New Zealand when land run-off carries dissolved substances such as nitrates and phosphates, into the sea. It is common for near-shore seawater to have higher-than-usual proportions of these substances, sometimes causing pelagic algal "blooms" or when especially severe (such as in the Gulf of Mexico off-shore from the Mississippi river delta), bacteria dominated, barren off-shore tracts. The earth also possess vast benthic oceanic deserts that are nearly devoid of marine life. Most organisms living in these poorly researched deep-sea zones are infaunal occupants, sparsely distributed and extremely specialised (Oschmann 1994). They live beyond the photic zone, in regions poor in nitrogen, phosphorus and silicon so necessary for the development of skeletal structures. The biological activity in seawater in an area potentially influences the amount of silicon or calcium present and this situation is detrimentally compounded when so little colonization occurs.

Fresh-water run-off from land or from melting ice may dilute sea water considerably such as in Fiordland, South Island; sometimes to 8 parts per thousand, or lower. New Zealand's many small bays, drowned river valleys, and enclosed seas such as Lake Ellsemere and the Firth of Thames, may seasonally possess salinity over 100 parts per thousand due to evaporation. Mass mortality of sessile organisms such as mussels and barnacles may result from such events. The total quantities of dissolved substances can differ from one marine locality to another and yet the ratio of dissolved substances in the open oceans remain the same.

Geomorphology and geochemistry of the seashore and inner-shelf will also affect seawater; shallow embayments have less bicarbonate than deeper water thus, there are exceptions to Dittmar's constant ratio of ocean content. The six most common elements in seawater in order of decreasing abundance are chlorine, sodium, magnesium, sulphur, calcium and potassium. These generally occur in association with other elements and are rarely found in a pure state; for example, calcium combined with oxygen forms calcium carbonate, the main constituent of mollusc shell. Chlorine and sodium occur together as sodium chloride (Halite or table salt) - the most common seawater salt, but only one of many. Large potassium concentrations occur in algal tissues. The rotten-egg smell of estuarine mud is a result of hydrogen sulphide, a form of sulphur combined with hydrogen.

Seawater samples from desired ocean depths provide isotopes useful in determining the age of water masses and tracing their flow. Continuous water samples pumped through "wet" laboratories such as those located at Leigh (Auckland University), Island Bay (Victoria University) and at Portebello (Otago University) and through analyzers that automatically sense the salinity, temperature, oxygen, pH and other seawater properties, enable pollution sensing and monitoring essential to marine habitat preservation.



Seawater contains all the atmospheric gases in solution. These include oxygen, carbon dioxide and the inert gases: nitrogen, argon, helium, neon and xenon. Unlike the atmosphere that terrestrial life-forms and marine mammals breath, the most abundant gas in the ocean is carbon-dioxide followed by nitrogen and then oxygen. In the absence of oxygen, the deadly poisonous gas hydrogen sulphide can reach high concentrations and eliminate oxygen respirators from a locality. These accumulations can occur around "black smokers" or ocean spreading-ridge hydrothermal vents, cold methane seeps in the form of vents or "mud-mounds" and "whale-falls". Common marine organisms are replaced by chemoautotrophic feeding mollusca, crustacea and by bacterial "mats". In such habitats, animals living there commensally host bacteria, which convert sulphate to sulphide and provide the oxygen and some food necessary to sustain life (Lutz & Kennish 1993).

Of all the gases contained within seawater, oxygen and carbon-dioxide are by far the most critical in maintaining chemical and biological balances in the oceans. Curiously enough, concentrations of oxygen in the world's oceans appear to have little effect upon the geographical distribution of marine organisms; their biological activity is the principle cause of changes in oxygen concentrations in seawater and many can tolerate low oxygen anyway. Oxygen can only be found within the surface layer of oceanic seawater, as the gas is dissolved from either the atmosphere or plant photosynthesis. Animal respiration and bacterial decay consume most oxygen at ocean depths. Carbon dioxide's primary source is the carbonate system whose components are mainly supplied to the sea by rivers. As with oxygen, biological activity also affects concentrations of carbon dioxide with an indirect relationship occurring between these concentrations and oxygen. An increase in dissolved oxygen content is most often caused by plant photosynthesis, which in turn consumes an approximately equal amount of carbon dioxide in the process.

Though an ocean is made up of water everywhere, it is useless to humankind unless distilled. As distilled water sustains life in some middle-east countries, millions of tonnes of fish and algae are pulled from the sea each year to feed earth's human population. A great many factors influence the distribution and interaction of the dissolved nutrients, gases and solids contained in seawater. Earth's climate is affected by the oceans and seas of the world just as sea-levels are affected in turn by climate. For many diverse organisms seawater is the chemical matrix of life, a conductor of heat and light, a transporter of food and disposer of waste. It contains the same elements as blood, sweat and tears. Of all our natural resources, seawater, because of it's quantity and availability, it's ability to regenerate and nurture food stocks and change the environment of earth, should be considered among our most precious commodities and one of the lifelines paramount to survival.

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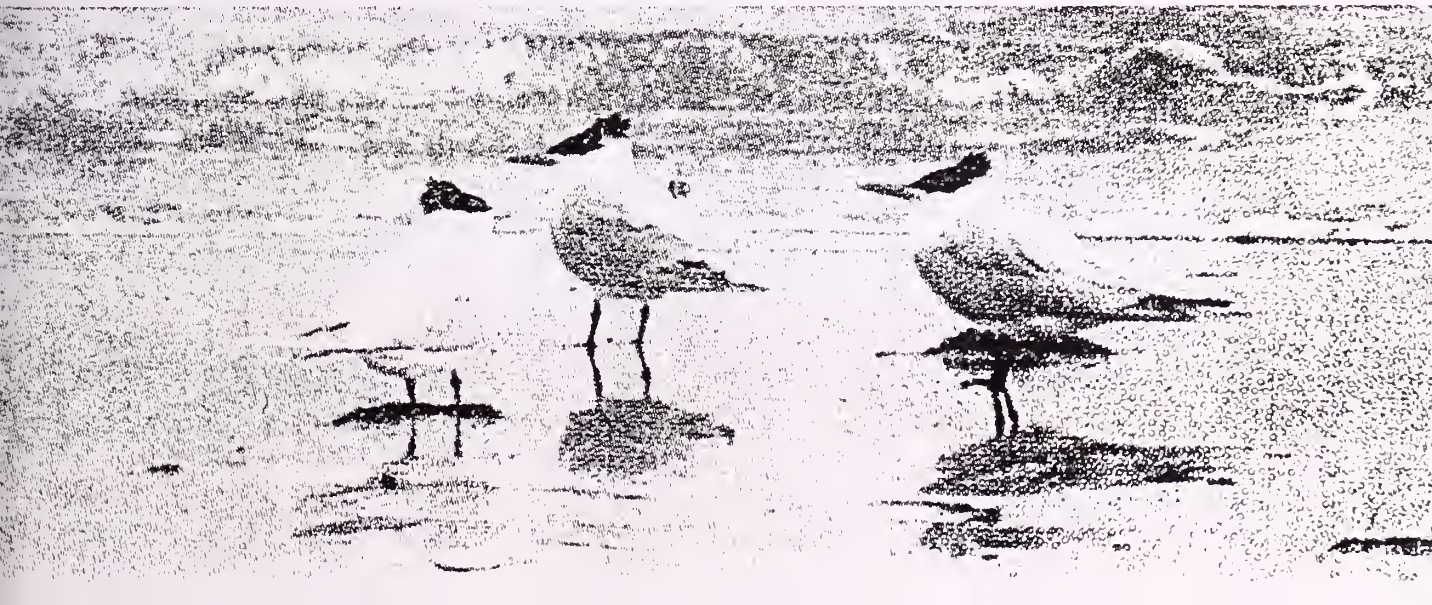

SHORT NOTE

John Marsden from Wellington reports that while in Auckland he found an unusual shell in Mission Bay shell sand. It has been identified by Bruce Marshall as *Retilaskeya zelandica* Marshall, 1978 in the family Cerithiopsidae. The holotype measures 4.90mm in height (Fig. 1). The known distribution for this species is Upper Pleistocene to Recent. Three Kings Islands, east coast of North and South Islands, Cook Strait, Fouveaux Strait, Stewart Island, Pukaki Rise and Auckland Islands, in shell sand to 805m (Marshall 1978).

This species is an addition to the Mission Bay list (Morley et al. 1997) and almost certainly is derived from the sand dredged in a depth of 40m, 4km off Pakiri, east coast of the North Island.

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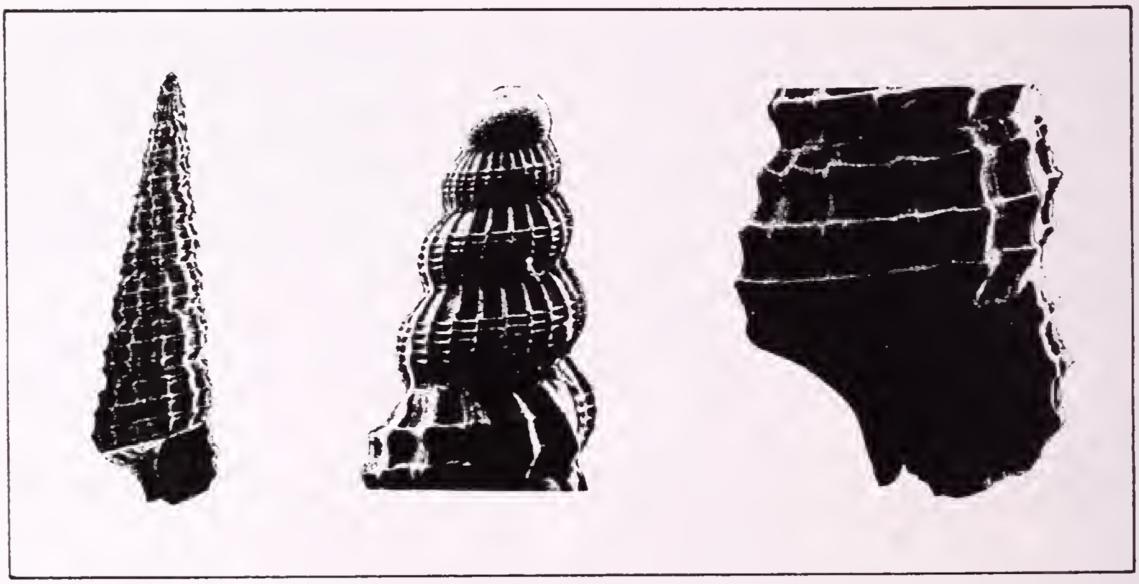

Fig. 1 Holotype of *Retilaskeya zelandica* Marshall, 1978

Powell, A.W.B. 1967 Shells of New Zealand, Fifth Revised Edition.
Quote "Hundreds of cases of name changes have taken place in the last twenty years, but I can now confidently assure the student that the need for wholesale changes is past and that we have at last achieved a nomenclature that except for minor adjustments should endure."

OBITUARY:LAURIE PRICE

Laurie Price passed away on the 18th September 1997

Laurie was for many years a member of the Conchology section Auckland Museum and had a particular interest in land mollusca. For about 20 years he carried out land snailing projects for Dr Solem of the field museum of Natural History, Chicago. Meticulous and thorough he became a Field Associate and collected material for research programmes being carried out by Dr.Solem.These projects took him to many Pacific countries; Hawaii, Samoa, Tonga Fiji, Vanuatu, New Caledonia, Tasmania and Norfolk and Lord Howe Islands.

With Dr. Salem and other museum people he spent considerable time on projects, in Australia, mainly Queensland and North West Australia. Much ground work was covered and on one expedition in the North West 42000 specimens were collected over an enormous area and sent back to the field museum.

Several land snail species bear Laurie's name. When the situation permitted he also collected marine material. *Cellana pricei Powell* from Apia Samoa was one species he found.

With failing health Laurie decided that his own extensive collection should be donated to the Marine Section of the Auckland War Memorial Museum

N & N Gardner

THE CONCHOLOGY LIBRARY

The Conchology Library is now set up in the home of Mrs Rae Sneddon. There has been considerable rearrangement of the house to fit it in and a lot of sorting has been done. Many of the Transactions of the Royal Society were found to be duplicated and have been withdrawn, but it was also found that four issues are missing. These are Volumes 47 (XLVII), 56, 57 and 70, if anyone can help. please.
'Tane' also had many duplicates which have now been withdrawn. So in spite of the upheaval in relocating the library, it has at least given me the opportunity to thoroughly sort out the contents. All the books remain, but the periodicals have to a great extent been cut back, so that back copies dated before 1990 have been removed and may possibly be used in the CDC at the Museum Some like "Of Sea and Shore" and "Hawaiian Shell News" have been retained as have other shell club newsletters from N.Z. and overseas.

The Library is now open again to all Shell club members any day of the week and you are welcome to come and browse and return and take out books when it suits you. Please make sure I am home.

Please use the library.

POIRIERIA

Auckland Museum

Conchology Section

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"Poirieria" is the Journal of a private club which is closely associated with the Auckland Museum. "Poirieria" is not available from Auckland Museum Institute library. "Poirieria" welcomes contributions on suitable topics, typed or on disc if possible, but neatly hand written articles are also welcome. Please send to: **The Editors, Tony & Jenny Enderby, P.O. Box 139, Leigh, New Zealand.**

Contributions on disc or printed on a wordprocessor should use CG times (Wordperfect) or Times New Roman (Word). 12pt, with titles 16pt bold and author 14 pt bold. Your co-operation will help keep the appearance of our Journal consistent.

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All other correspondence should go to: Glen Carter, 1 Guardwell Terrace, Mt Albert, Auckland, New Zealand.

EDITORIAL

This poirieria is the second for 1998, and it's late! There are two reasons. The first and most important is that Poirieria depends on your contributions. I have had a few articles for months but not enough for an edition. I have had various promises for months but it was not until I managed to persuade some of those authors to produce that I had enough material.

This is my last Poirieria as editor. I am now handing over to Jenny & Tony Enderby. Their editorial and typesetting skills will raise the presentation even more. Perhaps colour photos will be just that much more possible. I look forward to being a contributor instead.

So, keep those articles flowing. I have been promised enough to have another edition out by May, and Jenny & Tony would like to meet that deadline too. Please send articles to the Enderbys, the address is on the Contents page.

My second reason (or excuse), is the extent of my involvement with the Oceans gallery at Auckland Museum. I did not expect to be the co-ordinator of the project and with opening postponed from December to January everything else went on hold. I hope that those of you who are able to visit the Museum, will come and see the realistic slices of coast, the piece of the Poor Knight's wall, the aesthetically beautiful as well as the scientifically educative.

A word of caution

Members traveling overseas; please be really careful to obey the rules. Both with what you take out with you and with what you bring back. Be familiar with MAF, DoC and CITES regulations and KNOW what you can and cannot do.

We brought coral and clams back from the Cook Islands and had no problems because we took the trouble to get a CITES permit from the Cook Islands DoC before we left the country.

Please remember that it is illegal to buy or sell or take out of the country some of our large land snails. On return, please declare everything. We have found airport staff very helpful, and anything questionable is usually fumigated and returned within a few days for a small fee. It would be very helpful if a member would write an article about these issues with input from MAF and DoC...... Now there's a big hint for you!

Obituary

On more sombre note, we attended the funeral of Damaris Hole recently. Damaris was a very long-standing member indeed and an obituary to her will be included next issue. Our sympathy to her husband Geoff and family.

Thank you all for your help over the last few years. I have really enjoyed putting the Journal together. My very best wishes to Jenny & Tony.

Note: If you are curious about the shell illustrations used to fill in space, read Richard Dawkins "Climbing Mount Improbable".

Glenys Stace

Hiatellidae; *Hiatella arctica* (Linnaeus, 1767) and *Panopea zelandica* (Quoy & Gaimard, 1835)

by Margaret S. Morley

Hiatella arctica is in the family Hiatellidae. Apart from a deep water species, *Cyrtodaria* sp., the only other New Zealand hiatellids are the well known *Panopea zelandica* and *P. smithae*.

Hiatella arctica

The shells of *H. arctica* are very irregular due to their habitat in crevices, old pholad borings and holdfasts. The average size is 10mm. Often one valve is smaller than the other which disguises the gap at the posterior end. Although I have seen many live *H. arctica* the pink animal has always been withdrawn between the shell valves.

A specimen of *H. arctica* (Fig. 1) was obtained by bottom trawl off North Cape, in a depth of 50m on 12 February 1993. Wilma Blom who was recently identifying the worms from this location, kindly recycled the specimen to me. For the first time the "family connections" became obvious. Just like *P. zelandica* (Fig. 2) the siphons of *H. arctica* are conjoined and can extend several times the length of the shell. No wonder the specimen was originally sorted to the bulk lot of worms!

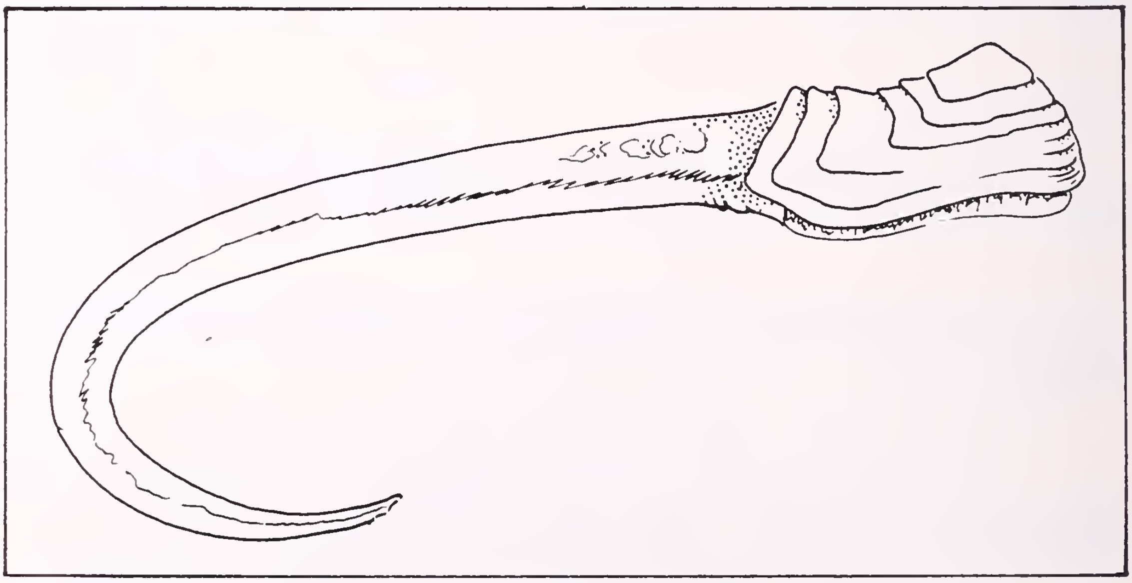

Fig. 1 *Hiatella arctica* showing extended siphons. Shell length 10mm.

Panopea zelandica

The specimen of *P. zelandica* (Fig. 2) was drawn from a live specimen seen at the factory in Pakawau, near Nelson, South Island in December 1988.

The common name is Geoduck, pronounced Gooeyduck. The name comes from an American Indian word "gwedec" which means "to dig deep". American collectors sometimes have to dig down up to their armpits in the sand. Occasionally the specimen digs deeper and gets away. The American species *Panopea generosa* is larger than *P. zelandica*, the shells are up to 23cm, the siphons 80cm in length, and the average weight of the whole animal including the shell is 1 kg. They are found in low tidal sand flats down to depths of 45m from Alaska to Gulf of California.

There is a limit of one Geoduck per person per day. They have been harvested commercially since 1971.

In New Zealand *P. zelandica* was harvested commercially for a trial period in the late 1980's 1-2km off Golden Bay, South Island (Fig. 3). Here the shells live buried 50-70cm in sandy mud in water depths of 6m and deeper. To harvest deeper than 10m is undesirable commercially as the diver has to decompress or limit his time underwater. The position of a specimen is pinpointed on the surface of the sand by the two joined siphons looking like a pig's snout, surrounded by a shallow depression (Fig. 4). The siphons are rapidly withdrawn when disturbed but their position is given away by the depression. Divers used water pressure hoses to blow away the surrounding sand so that the Geoducks popped up. They were then transferred to a net catch bag. Beds are heavily populated in ideal locations of stable sand and mud with good water movement. The number per sq. m varies from 1-8, with a tendency to live in patches.

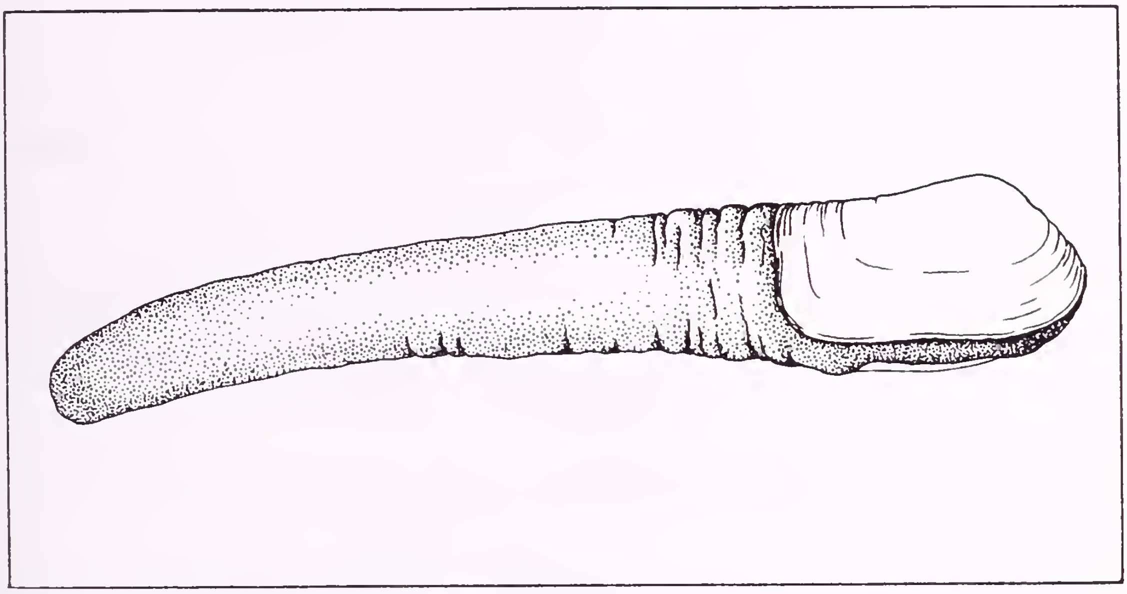

Fig. 2 *Panopea zelandica* **showing extended siphons. Shell length 120mm.**

At the Pakawau factory 4 women worked for a morning to process the previous day's catch of 6-7 big fishing containers. The shellfish were plunged for 30 seconds into a vat of boiling water. This facilitated the removal of the dark tan skin which was peeled off. The gem shells were thrown noisily into a tin barrel, destined to be added to the vast rubbish pile outside. This bit of the process caused acute pain to my ears but the women soon responded to my pleas and were keen to hand over the larger unchipped specimens. The siphons were cut off, then frozen and packed ready for export. A siphon weighs 250g, 1 kg of siphons fetched $18. The Japanese are very particular and pay according to quality. Their grades are "Pretty, Very pretty and Exceedingly pretty" . Those with palest flesh fetched the highest prices on the gourmet market. Goeducks are eaten raw, on kebabs, stir-fried, in sushi or as soup. The sample I tasted was quite pleasant, reminiscent of scallop. The women assured me that any local girls wanting to become pregnant had only to work at the factory for a few weeks to obtain their wish!

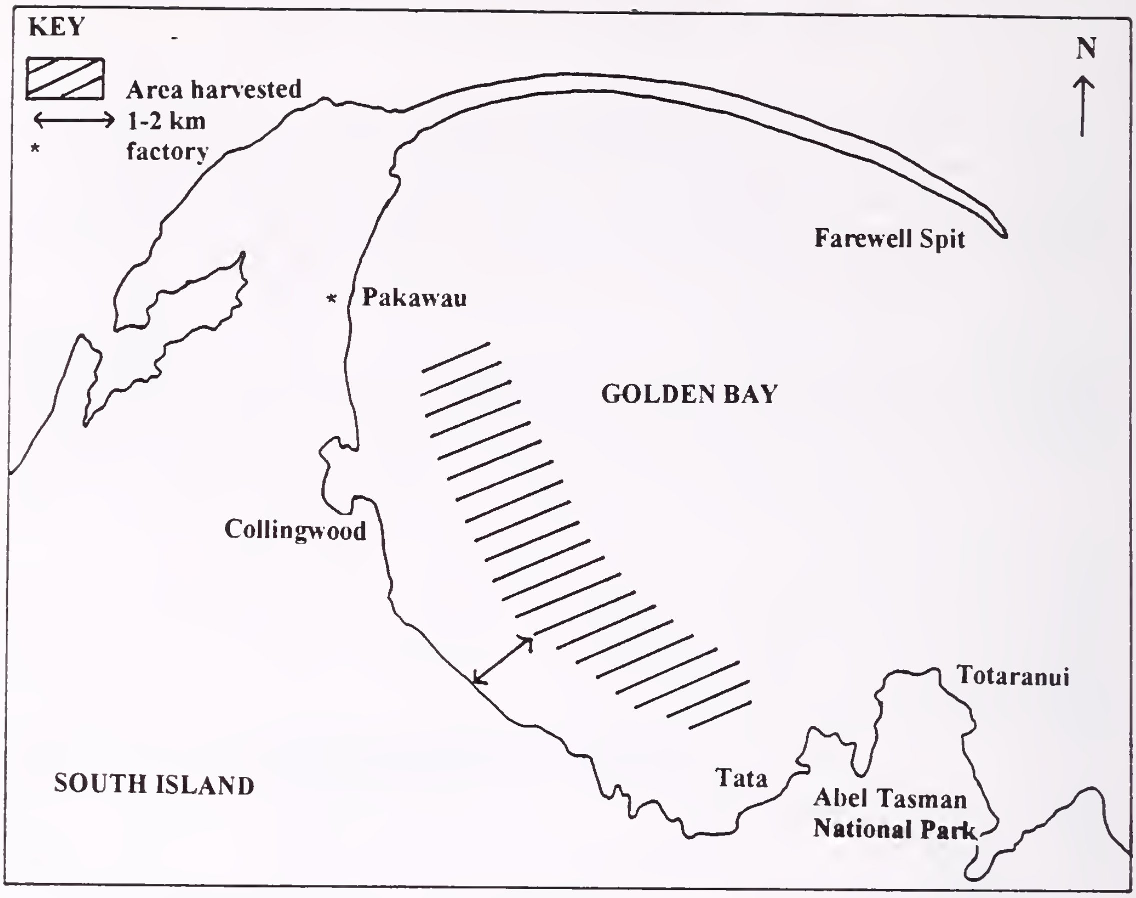

Fig. 3 Map of Golden Bay showing area harvested for *P. zelandica*

It was being planned to mince the low grade dark siphons, the mantle and the rest of the body to be marketed as "King Clam" patties.

The *P. zelandica* shells are bluish when alive but this fades in 3-4 days to a rich creamy white with darker markings. As in life, the valves do not close completely. Any attempt to force them breaks the hinge.

Life History
P. zelandica were observed spawning at high tide by one of the divers. He observed one specimen squirting out a puff of slightly milky fluid. The other specimens down current responded by releasing their reproductive material (Fig. 5). The process continued for some minutes as the tide turned.

Larva live in the plankton for 2 weeks. The divers found some juveniles in the beds of mature specimens. They take 6 years to grow to adult size and become sexually mature. By examining the layers through the thickness of the shell, it is calculated that they live up to 30 years.

The precious specimens given to me did not make me popular either in the campervan or in the camping grounds where I laboured to remove the persistent smell!

P. zelandica live on open coasts from Stewart Island to the east coast of the North Island, but are only rarely found with the animal inside after storms. Single worn valves are found more commonly, indicating populations in deeper water.

The *P. zelandica* quota was withdrawn soon after 1988 because research showed that harvesting is not sustainable.

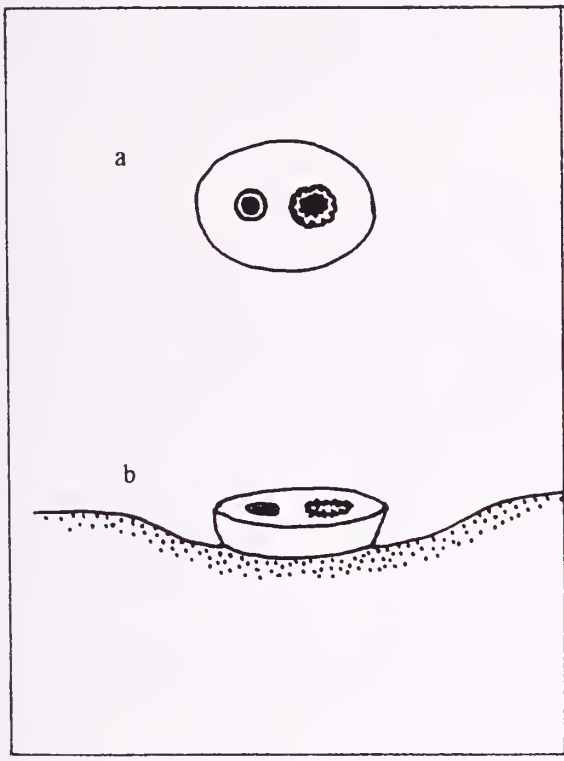

Fig. 4 Tip of *P. zelandica* siphons
a) from above b) side view

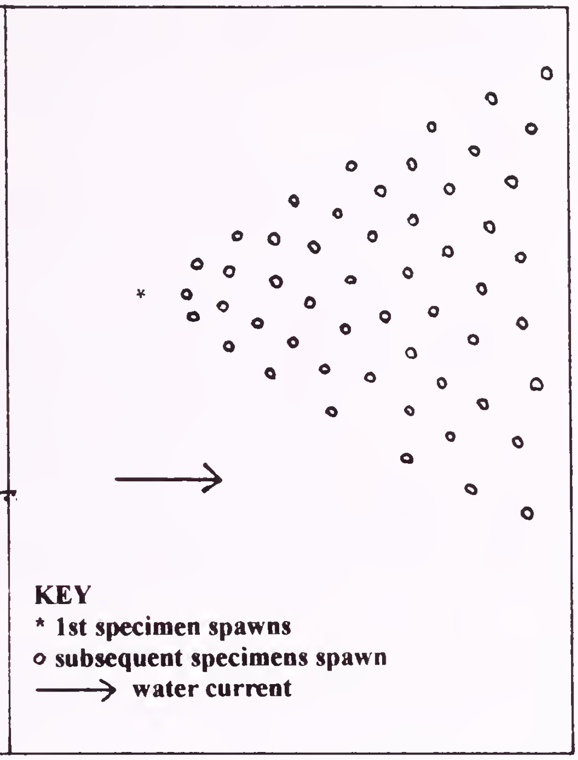

Fig. 5 Initial sequence of *P. zelandica* spawning

ACKNOWLEDGEMENTS
Thank you to the owner of Western Shellfish, Alistair McDonald for inviting me to watch the processing at the Pakawau factory; the manager, Brydon Harvey for much of detailed information and diver, John van der Leden for describing the underwater collecting and his observations of spawning.

A BLISTERPEARL IN *STRUTHIOLARIA PAPULOSA*

Henk K. Mienis

A review of the few samples belonging to the genus *Struthiolaria* Lamarck, 1816 in the National Mollusc Collection of the Hebrew University of Jerusalem (HUJ) revealed the presence of an interesting old specimen in an even older collection. Among the Struthiolariidae in the former Arthur Blok collection I found a sample consisting of four specimens of *Struthiolaria papulosa* (Martyn, 1784) with the only indication: New Zealand, which belonged once to the Rev. J. Hadfield (HUJ 3827/4). Without doubt it is a composite sample because two shells are well preserved and fresh looking, the third is covered with varnish and the fourth is an old, in part discoloured bluish-grey shell. It is the latter which caught my attention.

This shell has a height of 78.9 mm and in all features seems normally developed except for the aperture. It shows a well developed dentlike blisterpearl slightly of centre on the parietal wall. Due to its position it is difficult to give exact measurements however the approximate height is 4 mm, its width 3 mm and its length 8 mm. In addition a slightly elevated ridge with a length of 13 mm runs from this "dent" to the edge of the apertural callous.

The exact cause of this pearlformation could not be detected, but according to the colour a foreign object seems to have penetrated the area between the parietal wall and the mantle. Subsequently the object was encapsulated with new shell deposits by the snail.

According to my information this seems to be the first record of pearlformation in *Struthiolaria* in general and *Struthiolaria papulosa* in particular.

MOLLUSCAN SHELL FORMATION

Michael K. Eagle

Molluscs start growing their shells when they are an embryo and simply add to them throughout life. The Monoplacophora (primitive limpet-like shells with paired muscles and segmented body parts) and Amphineura (chitons) initially produce spicules and plates rather than a continuous shell. The Cephalopoda (except Nautilus spp.) have internalised or lost the shell, probably as an adaptation to aid swimming. External shells characterise the three remaining classes: Scaphopoda (tusk shells), Gastropoda (snails), and Bivalvia (clams). The exact time when the first shell material is secreted varies among species.

Bivalve shell production is almost always preceded by "invagination" (the pushing inwards of part of a sheet of cells so as to form a pocket opening on to an original surface) of part of the dorsal (directed upwards) ectoderm (superficial "germ-layer" of animal embryo). Because this invagination precedes shell secretion and because the early shell is formed in association with it, the invaginated tissue was named the "shell gland" (Kniprath 1981). This term implies that the invaginated cells secrete the shell, but although probable, this is unproven. Cells responsible for external shell formation in gastropods (Conklin 1897; Cather *et al.* 1976) and bivalves (Eyster & Morse 1984) have been identified. Most of the shell-secreting cells are descendants of the blastomere (one of the cells formed from the fertilised egg during cleavage), and develop into the ectodermal region of embryo called the "shell field". It is within the centre of this shell field that the invagination termed the "shell gland" forms and then disappears. The entire shell-secreting epithelium (sheet of firmly coherent cells, with minimal material between the cells) is referred to as the shell field invagination (Eyster 1983) or SFI, a name which avoids imparting a secretory function to the invagination. As the young mollusc continues to develop, the cells of the shell field multiply and spread over the viscera (internal organs of the body), forming an "epithelium" often referred to as the "perivisceral membrane" (Bickell & Chia 1979). The shell field epithelium gradually develops marginal flaps or tissue folds and is thereafter called the mantle or pallium of the animal.

Embryonic shells are made of both organic and inorganic elements. The organic material is secreted first, creating a living matrix (solid mass) of tissue upon which the calcareous shell material "nucleates" (gathers in a concentration) (Fig. 1). The stage at which shell mineralisation begins vary among species, as can the pattern of mineral deposition and the timing of change in the mineral deposition pattern. The beginning of shell mineralisation is probably related to feeding requirements when, for example, adaptive species feeding on nurse eggs are able to maintain flexible, stretchable shells (Bandel 1975, 1982). Abrupt changes in mineral deposition (affecting shell ornamentation) in gastropods are often not associated with events such as hatching and/or metamorphosis (Fretter & Graham 1962; Bandel 1975, 1982). Bivalve ornamentation such as radially striated (series of ridges and furrows spreading out from a central point such as the beak) and commarginally striated (ridges and furrows running parallel to a shell ventral edge), although genetic, occurs when the young mollusc is first able to close its shell valves (Waller 1981). Different degrees of early shell mineralisation exist in different species. Some species initially form only concretions, while other species fully mineralise their shells as they form them. Transparency of embryonic shells should not imply lack of mineralisation as shells of both pre- and post-hatched nudibranch *Aeolidia papillosa* are

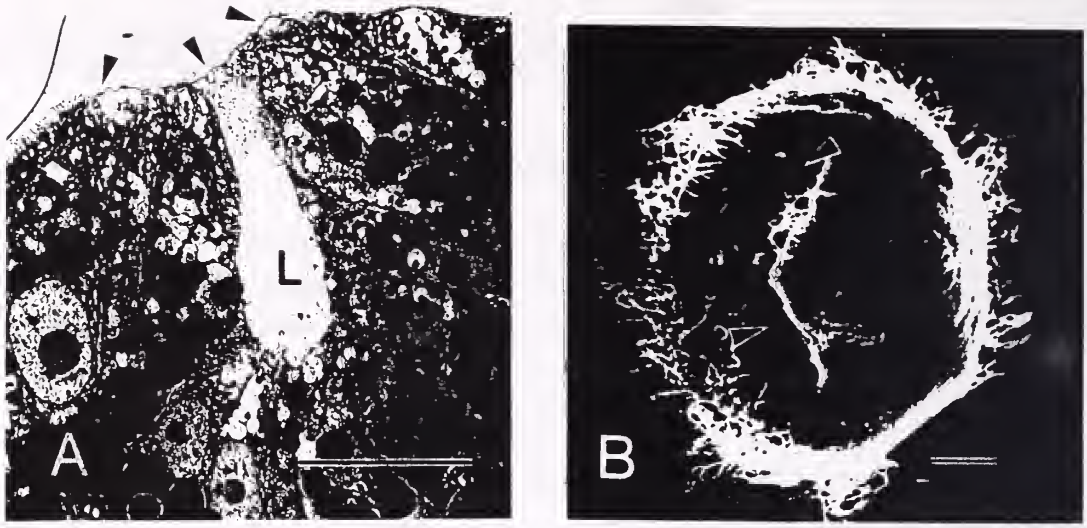

Fig. 1. A. Shell field invagination of the nudibranch *Aeolidia papillosa*, showing nearly formed organic shell material (arrowheads) lying over the entrance to the SFI lumen (L). Bar = 10 um. ; B. Trochophore of the bivalve *Spisula solidissima* at 32 hr after fertilisation. The first organic shell material is seen as a wrinkled layer (arrowheads) within the shell field recess. Bar = 10 um. (from Eyster 1984).

transparent but calcified (Eyster 1983). The major inorganic element of adult molluscan shells, the mineral calcium carbonate, is deposited in several forms. Pre-metamorphic molluscan shells indicate that most early shell material is aragonitic (Carter 1980). This is interesting since the calcium carbonate form, aragonite is less stable, is more subject to leaching by seawater, and is denser and perhaps less economical to produce (Stenzel 1964), than the calcium carbonate form, calcite. However, aragonite has the possible advantages of both greater structural strength and lesser tendency to cleave (Stenzel 1964).

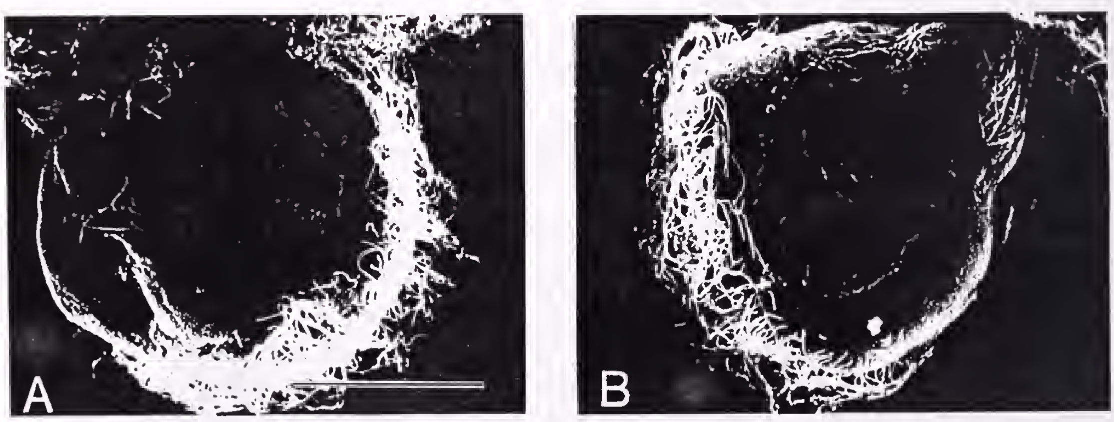

Fig. 2. Trochophores of the bivalve *Spisula solidissima* at 38 hr (A and B) after fertilisation. The shell forms a "saddle" hanging down both sides of the larva. The blastopore is visible in A. Bar = 20 um. (from Eyster 1984).

The role of shell field invagination in early bivalve shell formation has been examined in several genera, including *Mytilus* (Kniprath 1980b) and *Spisula* (Eyster & Morse 1984), both of which occur on rocky shores and surf beaches in all marine provinces of New Zealand The earliest shell material in *Mytilus* and *Spisula* forms on the outer surface of the trochophore (ciliated planktonic larva of mollusca), after the SFI lumen was not visible and 20 hr after external fertilisation respectively. Several differences are revealed in comparison of gastropod and bivalve shell field invaginations and early shell formation. In gastropods, the pore of the SFI is circular while in bivalves it is elongate. The first organic shell material initially forms a ring in gastropods (Kniprath 1977) and then a cap. In bivalves the first organic shell material forms a saddle shape (Fig. 2). These differences probably reflect the subsequent development of univalved shells in gastropods and bivalved shells in bivalves.

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Growth series *Siphonaria propria* Jenkins, 1983

by Margaret S. Morley

The specimens of *Siphonaria propria* Fig. 1-4 show the development of the protoconch through to the adult specimen. The spiral origin is usually eroded or encrusted in mature specimens.

All the specimens were collected in shell sand taken from around low tidal rocks at Airedale Reef, Waitara, Taranaki on 8 March 1997.

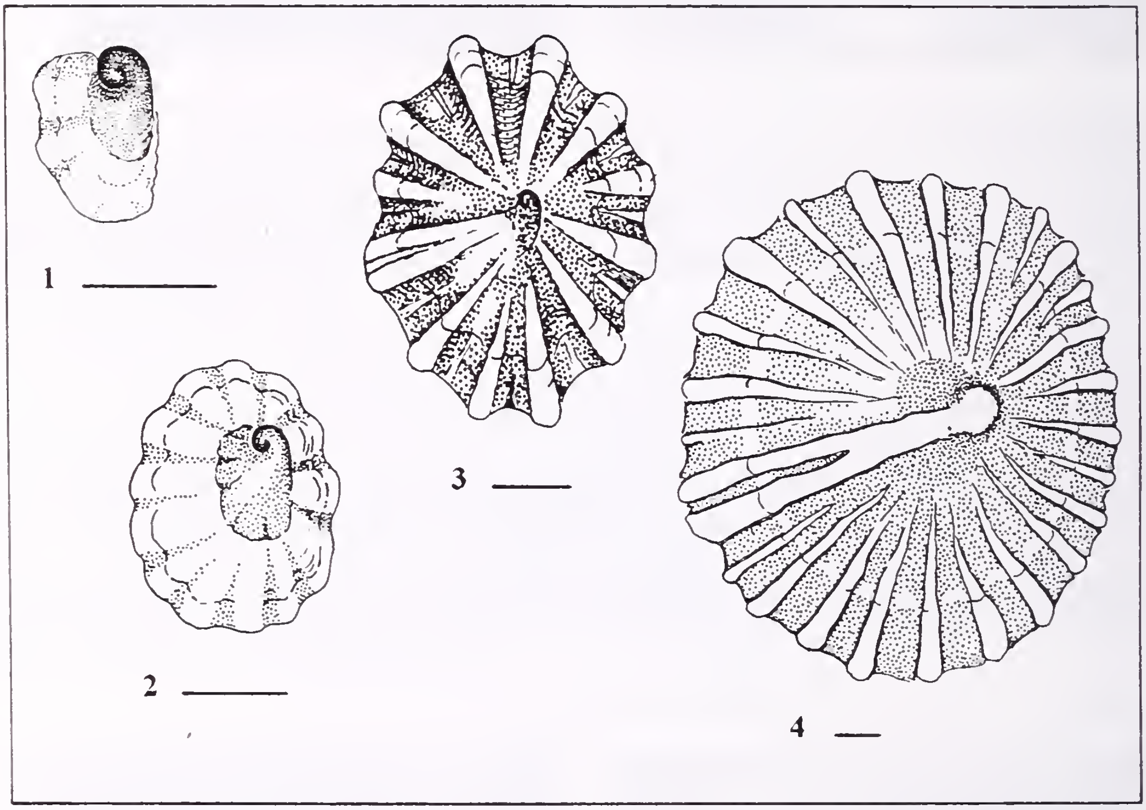
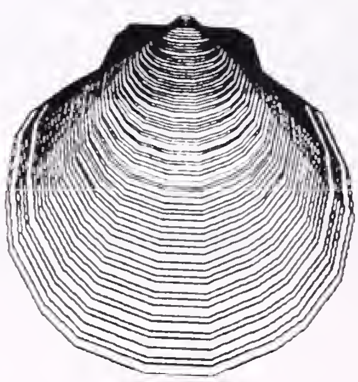


Fig. 1-4 Siphonariidae: *Siphonaria propria* Jenkins, 1983 Scale bar =1.0mm



SOWERBYS...1,2,3,4.

By Nancy Smith

In 1967 Dr. Powell gave a lecture on Authers of New Zealand Conchology in which he mentioned the input of the Sowerby family. Recently I heard that one family of descendants of the Sowerbys lives in New Zealand. This reminded me that I had never really known how many Sowerbys there were nor what they had done, so I set about counting them.

James Sowerby (1757-1822) trained as an artist, drew flowers, became interested in botany and produced some classical botanical publications. Next he studied zoology mineralogy and fossils, and in each subject he "produced works renowned for the care and fidelity of their illustrations".

J.S had 3 sons; Charles Edward (1795-1842) whose line continued in the botanical field, James de Carle (1787-1871) who carried on the fossil research as well as some botanical interests and George Brettingham (1788-1854) who started the confusing line of 3 G.B.Sowerbys so well known to us in the Conchology field.

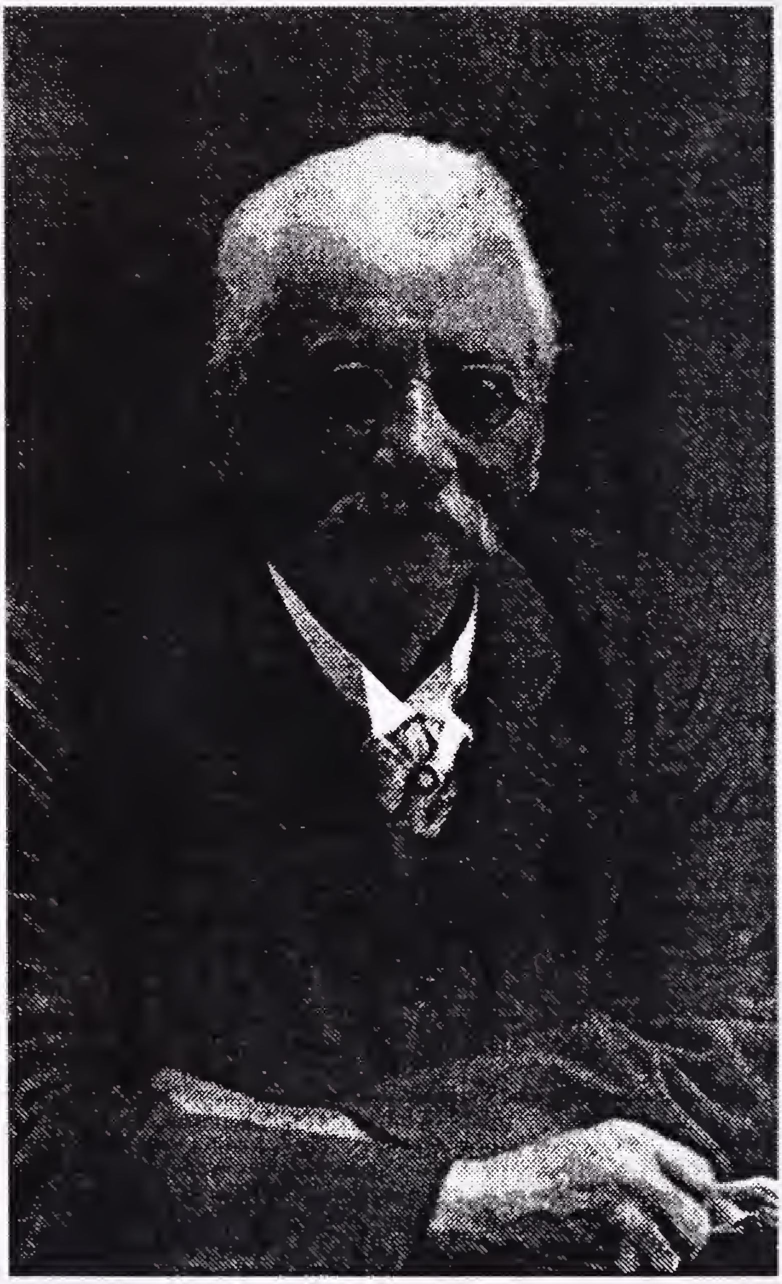
George Brettingham Sowerby the first or elder (1788-1854) conchologist and artist, worked with his father on illustrated works of natural history and with his older brother on fossil publications. Independently he wrote many papers and books mainly on shells and fossils. He also contributed text to the works of his son:-

George Brettingham Sowerby the second (1812-1884) conchologist and artist, assisted his father, produced some beautiful coloured illustrations including those for Reeve's "Conchologia Iconica" and wrote numerous papers desribing new species, some of which were from New Zealand. Some of his work was completed by his son:-

George Brettingham Sowerby the third (1843-1921) completed the "Thesaurus Conchyliorum" started by his father with contributions from various other Conchologists, brought out the second edition of his fathers "Illustrated Index of British Shells". He published widely and is represented in the New Zealand fauna but is not so highly regarded as his predecessors.
True to his genes the third G.B.S. called his son George Brettingham, but of this man I have found no record! It is his sisters family who have ended up in New Zealand.

If you think this has sorted out the Sowerbys, be careful. You might find George Brettingham Sowerby the 3rd described as Sowerby the 4th, or G.B.S. the 2nd as the younger! This one sometimes put 'F.L.S.' after his name to distinguish himself from his father, even though his father was also a Fellow of the Linnean Society. Sometimes their dates overlap, e.g.*Amoria ellioti* Sowerby 1864, could apply to the 2nd or 3rd G.B.S equally well. So if you care which one, you need to study this awkward family some more!

refs: Dictionary of National Biography vol.18 (British)
Powell A.W.B. notes on a lecture by.



Henry Suter

HENRY SUTER, A GREAT CONCHOLOGIST!

Henry Suter was one of many foreign born naturalists who have made a large contribution to New Zealand science.

A Swiss, he was born in Zurich on the 9th March 1841 and received his education there. He trained as an analytical chemist, but from a boy was deeply interested in land and fresh water mollusca and natural history generally. He enjoyed the help and friendship of many well known European naturalists in particular the conchologist Dr. Albert Mousson. For some time he was manager of his father's silk-works in Switzerland, but in 1887 he emigrated with his family to New Zealand, partly lured by the attraction of a new fauna. He acquired bushland near Eketahuna but lasted less than a year as a farmer. Captain Hutton then took him under his wing procuring a job for him as assistant manager of the "Hermitage" Mt. Cook, and subsequently helped him with jobs at Canterbury Museum and other institutions. Both 40 mile bush near Eketahuna and Governors Bush Mt. Cook loom large in his work on small landsnails. While T. F. Cheeseman, the curator of the Auckland Museum from 1874-1923, was away Suter acted as curator of that museum. In 1910 he was appointed to the Canterbury Museum to arrange their shell collection and his displays were there for many years.

Suter started contributing papers soon after he arrived and published papers in the "Proceedings of the Malacological Society of London", The "Transactions of the New Zealand Institute" (now the Royal Society of New Zealand), the "Records of the Canterbury Museum", the "Journal of Malacology" and all sorts of other venues. He even wrote papers on land mollusca from Brazil, South Africa and Tasmania but his friends urged him to concentrate on New Zealand.

Henry Suters major contribution, the "Manual of New Zealand Mollusca" was published by the Government Printer in 1913 and the companion "Atlas of Plates" in 1915. Mr. Augustus Hamilton evidently obtained from the Government the means for its production. It was an extraordinary work for its day and was the molluscan "Bible" for many years. It was eventually overtaken by the work of A.W.B. Powell, in particular "New Zealand Mollusca" (1979) but even Powell only took his references back as far as Suters "Manual" and serious researchers still widely consult the earlier work. Hedley writes in an obituary that "at no time did Suter quite realize the undiscovered residue of the fauna on which he worked ------- and wrote as if he had in hand if not all at least most of the species" present. This is rather reminiscent of Powell's unguarded comment that "New Zealand Mollusca" should dampen name changes for the forseeable future!

Suter also made a contribution to the study of fossil shells and from 1915 to 1922 the N.Z. Geological Survey published several bulletins written by him.

Henry Suter died July 31 1918 and his collection of mollusca was acquired by the Wanganui Museum but later became the property of the New Zealand Geological Survey, though the landsnails were acquired by the National Museum. His collection of European land and freshwater snails was acquired by the Australian Museum.

His many descendants, including great grand-children live in various parts of New Zealand. He was a prodigious letter writer and one can only hope that a suitable scribe amongst these descendants will one day publish these letters in a detailed biography.

(Compiled with a bit added by J.F. Goulstone using an article in the the Christchurch Press, 1970 written by an unknown Canterbury Museum author and an obituary in 1919 by Charles Hedley)

ON THE AUTHORSHIP OF *ARGONAUTA NODOSA*

Henk K. Mienis

In the list of New Zealand mollusc names, Spencer & Willan (1996) mentioned as author of *Argonauta nodosa* Solander, 1786. In the same list the author of *Umbraculum umbraculum* was given as (Lightfoot, 1786). Both species were first "described" in the famous Portland-catalogue. The authorship of this anonymous work has been ascribed in the past to two authors: Daniel Carl Solander (1733-1782) and John Lightfoot (1735-1788). Solander worked indeed for the second Duchess of Portland, Margaret Cavendish Bentinck, and provided many manuscript names for undescribed species in her magnificent collection (Dance, 1966). However, when the Portland collection went up for sale, Solander was already dead for 4 years. In fact it was the Rev. John Lightfoot (1735-1788), chaplain, librarian and mentor to Her Grace, who prepared the sales catalogue, inclusive all the references to the new species. For this job he used intensively many of Solander's names, but others he changed or he altered Solander's references to already existing figures in the literature. This confinced Dance (1962) in his decision to consider Lightfoot as being responsible for **all** the new names introduced in the Portland-catalogue. This opinion is now generally accepted although now and then as in the case of Spencer & Willan, Solander's name pops up again.

It may be noted that Lightfoot was not only the author of *Argonauta nodosa* but also of *A. navicula* and *A. hians*. For all three species references were given to figures in a pré-Linnaean work by Rumphius (1705).

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CEPHALOPOD BIOLUMINESCENCE

Michael K. Eagle

Bioluminescence describes light produced by living animals. It is exhibited on land by a few insects such as the glow-worm, but is more prevailent in marine creatures such as species of bonyfish, jellyfish, protozoa, and various mollusca including cephalopods. Cephalopods are specialised molluscs that have evolved the ability to swim; the great majority of species move by jet propulsion from the mantle cavity. Cephalopods, including octopus, cuttlefish, and squid, inhabit all bathymetric zones of the world's oceans (Fig. 1). They possess the ability to change colour almost instantly (Hoyle 1886), a form of nervous reaction for defence via camouflage and sexual display. Colour change is facillitated by several types of chromatophore that are expanded by radial muscles. For example, in the bottom-haunting sepiolids the chromatophores form three layers, yellow near the surface, orange-red in the middle, and a deeper layer of brown (Morton 1971). Taxonomy of New Zealand Cephalopod species in this note follows Spencer & Willan (1995).

In addition to chromophores, about one-third of all the known species of squid and three-quarters of the known species of cephalopods (particularily those living in deep water), have specialised luminescent organs or photophores. Few Octopoda are bioluminesent; only two deep water species - *Melanoteuthis luceus* and *Eledonella alberti* possess photophores (Chun 1910). All species within four families of squid possess light organs; Lycoteuthidae *(Lycoteuthis diadema; L. lorigera)*; Lampadoteuthidae; Bathyteuthidae and Enoploteuthidae (New Zealand species *Abraliopsis gilchristi* and *Enoploteuthis galaxias*), as well as most if not all of the Cranchiidae (New Zealand species *Cranchia scabra; Leachina rynchophorus; Bathothauma lyromma; Belonella sp. ; Galiteuthis glacialis; G. pacifica; G. suhmi; Liguriella podophtalma; Megalocranchia maxima; Mesonychoteuthis hamiltoni; Sandalops melancholicus; Taonius cf. pavo; Teuthowenia pellucida*) and Histioteuthidae (New Zealand species *Histioteuthis atlantica; H. bonnellii corpuscula; H. cf. celetaria pacifica; H. cf. corona cerasina; H. hoylei; H. eltaninae; H. macrohista; H. meleagroteuthis; H. miranda; H. sp.*). The cold, bright light that is emitted from luminescent cephalopods is produced either by photophores, symbiotic bacteria, or secreted mucus (Buchsbaum 1966). Photophores in squid vary in size, position, and structure. Some photophores are less than 1 mm diameter as in *Vampyroteuthis infernalis* (tow-netted at 1000 m south of Cape Palliser and also obtained by the Galathea Expedition over the Kermadec Trench (Powell 1979)), others, as in *Meleagroteuthis*, are greater than 10 mm in diameter. Some squid species have fewer than 20 photophores whilst other species such as *Watasenia scintillans*, have in excess of 100. Some squids have photophores only on the eyes and arm-tips whilst others such as the genus *Abralia*, are spread over the whole body surface including the head eyes, eye-sockets, arms and funnel (Fig. 2). Some deep-sea squids including *Bathothauma lyromma*, have photophores on the balls of eyes which are at the end of stalks (Buchsbaum 1966). The surface of each photophore is covered with a layer of tiny, transparent, elastic cells which contain luminescent pigment. The colour of the light emitted by the pigments of various species of squid such as *Histioteuthis, Calliteuthis, Pyroteuthis, Lycoteuthis*, and *Mastigoteuthis*, is often different. A New Zealand species, *Enoploteuthis galaxias* has eyes that shine with ultramarine blue, the lateral one with a pearly sheen; the front of the lower surface of the body is a rich ruby red and those to the rear a snowy white or pearl, except the meridian photophores which are sky blue (Chun 1910). Another New Zealand species,

Fig. 1. Giant squid are the largest of all invertebrates (after an old engraving from Figuier, from Buchsbaum 1966).

Fig. 2. Luminescent squid are mostly deep-sea forms living in perpetual darkness (based on Chun, from Buchsbaum

Pyroteuthis margaritifera emits similar variously coloured lights.

Bioluminescent Teuthida like Loliginidae (New Zealand species *Sepioteuthis australis* and *S. lessoniana*) and Sepiolida produce light by an association between mollusc and symbiotic luminescent bacteria. As well as luminescent bacteria harboured on the skin, the ducts of the accessory nidamental glands are filled with masses of photogenic bacilli or cocci. *Sepiola birostrata* is a host squid possessing a more complex light organ, with particular specialisation of the nidamental gland equipped with pigment sheath, lens and reflector inhabited by luminous bacteria with the sole function being to produce light internally. Luminescent bacteria are transmitted to the next generation attached to egg membranes (Lane 1963). *Heteroteuthis dispar* (a sepiolid about the size of a person's thumb-nail - 2750 m) is able to emit light by secretion in the form of a mucus discharged from a gland near the ink-sac when touched or otherwise disturbed. The mollusc ejects from its siphon little packets of mucus containing luciferin and luciferase, which show no light on ejection. As the oxygen within the water oxidises the luciferin in the presence of the enzyme luciferase, a number of brilliant rod-shaped particles appear, producing light (Buchsbaum 1966). As the cummulative mass of packets reacts with the elements of seawater, the mass expands, causing more glowing particles to be manufactured and light emitted. The perceived colour

of the light is blue-green. Individul secretions ejected by *H. dispar* provide a photo-chemical reaction up to five minutes in duration, and the mollusc is able to repeat the processs a number of times (Lane 1963). As a consequence, the surrounding water becomes cloudy with diffused waves of bioluminescence. *Sepiolina nipponensis*, a small Japanese squid about 120 mm long, also produces biluminescence by secretion. The mollusc has a luminous organ located on the ink-sac and when disturbed ejects a luminous secretion into the funnel which then discharges it into the water as a bright, bluish light (Lane 1963). In bioluminescent Chiroteuthidae (New Zealand species *Chiroteuthis capensis*) and Mastigoteuthidae(New Zealand species *Mastigoteuthis flammea*) the photophores extend the length of the long tenticles.

It is thought that bioluminescence in cephalopods produced by photophores probably compliment chromatophore patterns in aiding breeding recognition, and may also be sexually attractive (luminescence often differs in opposite sexes). Additionally, bioluminescence may also be useful in hunting food, a visual defence mechanism, a species beacon on mass migrations, or a feeble attempt to illuminate the mollusc's immediate surroundings.

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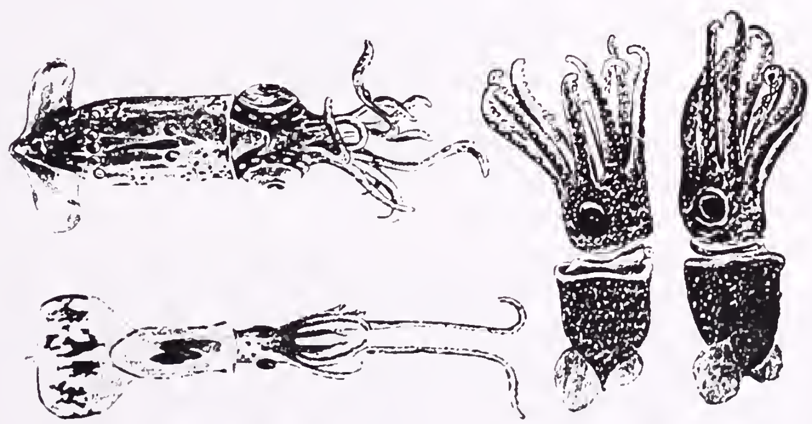

REMEMBERING SCIENTIFIC NAMES

Part 4: Some Suffixes, Sound Correspondences and More Roots

by Frank Boulton

Introduction

In this article of the series, we shall look at a number of common suffixes and explain their English equivalents. We shall also have a look at what linguists call *sound correspondences*, as these can be helpful in identifying the same root in its many disguises. Linguists find these correspondences very helpful in memorising whole dictionaries of words. We will conclude with another table explaining common roots.

Please remember that this series does not attempt to be linguistically rigorous. We want to isolate the few facts that make our scientific names easier to remember.

Suffixes

Suffixes are the little groups of letters, often syllables, that we add to words to make new words. English examples include *-full*, *-ish*, *-ous*, *-ic*, *-al* and many others. In this definition of suffixes, we also include inflections such as *-ed* and *-ing*. The distinction between suffixes and inflections is not helpful in this context.

I have frequently been asked about a pair of very common suffixes, namely *-ensis* and *-icus*. These form adjectives and so their form changes with the gender of the genus name. Thus we get masculine *-ensis* and *-icus*, feminine *-ensis* and *-ica*, and neuter *-ense* and *-icum*. The difference in meaning is quite simple. *-Ensis* means belonging to, living in or originating from a place. *-Icus* refers to quality and can mean *pertaining* to. Its meaning is very vague compared to that of *-ensis*. *-Icus* has a similar range of meanings to English *-ic* and *-ish*. In fact *-ic* was borrowed from *-icus* and *-ish* is the etymological cognate of *-icus*. (Cognates are just groups of words sharing the same ancestry. An example will illustrate the difference in meaning. *Rhinoclavis sinenesis* gets its name because its territory includes Chinese waters. It is an actual resident of China. On the other hand *Umbraculum sinicum* has no geographical connection with China. Its name, derived from its appearance, quite literally means *Chinese parasol*. The suffix *-ensis* has come into English via Anglo-Norman French in the for *-ese*. You will also encounter the same form as the English on Italian menus in the names of dishes such as *spaghetti bolognese*.

-Ātus a very common suffix. It comes in a number of variations such as *-ētus*, *-itus*, *-ūtus* and *-tus*. Occasionally we find the variations *-sus* and *-ssus*. *-Ātus* is by far the commonest form. It is used to form the past participle of verbs just like the English *-ed*, with which it is cognate. Like its English counterpart it can also be added to nouns giving the meaning of having something, e.g. *cornu* = horn, *cornūtus* = horned, used just as in English phrases like *horned devil*. When we wish to included an adjective in such constructions, we just tack it on in front in English. Latin, however, tends to drop the participial ending, preferring to say *long-horn* rather than *long-horned*. Thus we have *rufo-zon-us* meaning *having a red belt*. However, exceptions occur, such as *albo-zon-at-us* meaning *having a white belt*. These are due to the fact that modern zoologists are not so well versed in the finer points of Latin grammar as their predecessors in other centuries. Remember that all of these part participial forms are adjectives and so change their endings to *-a* in the feminine and *-um* in the neuter.

-Ēsc-ēns is actually a double suffix with the meaning *becoming*. The *-ēsc-* part is attached to adjectives and other words to create verbs meaning that something is beginning. Thus from *flāv-us*, yellow, we get *flāv-ēsc-ō* meaning *I am starting to be yellow* or *I am becoming yellow*. The *-ēns* part is the present participial end. It is an adjectival form but it does not change for gender. Thus, *flāv-ēsc-ēns* means *becoming yellow*. The English suffix *-ish* usually gives a good translation of these words, e.g. *yellowish*.

Sound Correspondences

This is a linguistic phenomenon, which affects all languages. It is a vast, complex and very technical subject. We will only look at a few of the simpler examples, which will help you to remember the different guises, in which a single root can occur. We only have to concern ourselves with Latin, Greek and English. However, if you speak one of the other Indo-European languages, such as a Romance language(e.g. French), a Germanic language(e.g. Dutch), a Slavonic language(e.g. Polish), a Baltic language(e.g. Latvian, Lithuanian), a Celtic language(e.g. Welsh), Modern Greek or even one of the languages of Northern India, then you will spot many more of the sound correspondences, which should help you to remember the scientific name.

To start off with, we shall look at the sound correspondence, whereby the English and Latin words have an initial *s-* but the Greek equivalent has an initial *h-*. In the examples below, it is helpful to bear in mind that the letter *y* represented a sound like the *u* in French *tu* of the sound of *ü* in German *über*. In very early Greek the sound was more like the *oo* in *moon*. Treating it as some kind of *u* sound will show up the similarities between words.

Latin	Greek	English
sex	hex	six
septem	hepta	seven
sub	hypo	
super	hyper	
suāvis	hēdȳs	sweet
sal	hals	salt
serpēns	herpeton	
sēmi-	hēmi-	
	homoios	same
sūs	hȳs	swine
sōl	hēlios	sun

Notice that for various reasons there are gaps in some of the columns. Words often fall out of use, so that we do not have a complete set of cognates. We could have included the English word *serpent* and the prefix *semi-*. We left them out, because they have not been handed down directly from Indo European and thus do not form part of this pattern of sound correspondences. They are borrowed from Latin and, therefore, belong in the Latin column rather than the English column. Sometimes, an entry is omitted, because other elements make the correspondence too complicated for using for mnemonic purposes. Note that initial Greek *h-* can indicate not just a missing *s-*, it can also give a clue that a *w* may also have disappeared, as in *sweet* and *swine*. *Hals* can be masculine or feminine. When masculine, it means *salt* and, when feminine *sea*.

Notes on the Table

Notes on the content and use of this table are the same as for the third article in this series. Refer to Poirieria 20, April 1997, page 36.

Root	Example	Meaning	Cognates
zōnē = belt	*Micrelenchus rufozonus* *Flammulina albozonata* *Buccinulum fuscozonatum* *Mendax trizonalis*	having a red belt having a white belt having a dark brown belt having three belts	zone evzone, the Greek guards with white skirts, named after their ornate belts
glāns = acorn	*Austrofusus glans* *Cominella glandiformis*	acorn acorn-shaped	gland glans penis
cinc-t-us, -a, -um = belted (past participle)	*Hydatina albocincta* *Eatoniella roseacincta* *Nodilittorina cincta* *Terebra circumcincta*	having a white belt having a pink belt having a belt having a belt around it	cincture
hals = salt, sea, saltwater	*Haliotis iris* *Halicardia maoria* *Odostomia hyphala*	rainbow sea-ear* Maori sea-heart* submarine**	halogen halide
albus, -a, um = white	*Haloginella albescens*	whitish	albino
flāvus, -a, -um = yellow	*Onchidella flavescens*	yellowish	***
chatham-ens-is, -i, -e = of the Chatham Islands****	*Cellana chathamensis* *Calliostoma chathamense*		
glauc-us, -a, -um = grey-green	*Bursatella glauca* *Chiton glaucus*	grey-green	glaucous glaucoma

* Translation includes both generic and specific name.

** *Hyp-hal-a* shows the structure of the word. No apologies for the unconventional hyphenation, as it is intended to reveal the components of the word and has no regard for Greek phonology.

*** There are no commonly used derivatives of *flāvus* but it may help to know that *flame* is from the same root.

**** This has been included as an example of the suffix *-ensis*.

The pickings at Pahi

By Glenn Carter

Middle Eocene molluscan fauna of Bortonian age, (some 42 – 46 million years ago) have been collected from a number of locations throughout New Zealand, notable from the North Otago and South Canterbury areas of the South East Coast in the South Island. Collections of Bortonian age fauna have been recorded from a few locations in the North Island but the diversity and preservation is poor. The exception is the greensands at Pahi, on the Pahi Peninsula.

Pahi can be found between Paparoa and Matakohe off state highway 12 on the northern shores of the Kaipara Harbour. To get to the Pahi greensands drive down the Pahi road some 6 km then turn down Dems Road about 1 km before reaching the Pahi township. Park at the end of this short road and step on to a small crushed limestone beach, hope fully you arrive when the tide is out or else you will not see the greensands or be able to collect much and you will get wet!

The greensand can be found by walking south to the end of the beach. The shore here is made from marine sediments that contain a sufficient quantity of the mineral glauconite to give the green colour to the fresh unweathered rock. Weathered or otherwise oxidised greensands are brown. The Pahi greensand is a calcareous sometimes pebbly, medium to coarse grained and contains conglomerate and concretionary layers

A diverse fauna has been found here including mollusca, vertebrate bones, sharks teeth (I have never found any teeth), wood and corals. Though the preservation of some of the fossils is poor and finding fresh exposures of greensand not covered in pacific oysters depends on what the whether conditions have been like. There is always a chance of finding something loose among the loose rocks on the beach especially at the southern end, I collected a nice *Offadesma marwicki* in a small flat concretion there. Its here by the bank, that larger concretions can some times be found weathering out.

Molluscan fauna that has been found at Pahi include

Saccella semiteres
Saccella pahiensis
Pseudotindaria (?) ferrari
Limposis cf. campa
Cubitostrea gudexi
Glyptoatis bartrumi
Monalaria concinna
Pinna distans
Tatara pahiensis
Speightia spinosa
Aturia mackayi

The Monalaria, Cubitostrea, and Speightia are found in shallow water assemblages such as the Bortonain from North Otago. Though there are at least 3 different facies found here and some of the species are found only in one where others are not as restricted.

The *Cubitosria* which was very wide spread during the Eocene else where in the world along with *Speihtia* and some other Pahi taxa have not been found after the Bortonian Stage in New Zealand. Possible because of a drop in world sea temperatures

The Aturia must have been reasonably common, as I have collected more than 12 separate specimens of this cephalopod. Some in situ in the greensand others lying loose on the beach. A near perfect *Cucullea waihaoensis* that was plucked from the greensand was a lucky find, but a lot of the fossils have "rotted" or are extremely fragile, so collect judiciously and avoid unnecessary destruction in the process. The hard fossils from concretions are fine to drop in a bag but any collected from the greensand will need to be wrapped.

If you have no luck or the rest of the family get bored. Then continue walking along the beach around the point to the small village of Pahi, there you can have a look at one of the worlds largest Moreton Bay fig trees in the park by the camp site.

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Figure 6.14 Theoretical 'shells' that don't exist – except perhaps as antelope horns.

The Library

by Rae Snedden

I want to tell you a story about our library.

I took over as librarian of our Conchology Section in 1976. I have been working in libraries since before I left school and trained as a librarian soon after. Libraries are very important to me and it gave me great pleasure at our monthly Conchology meetings to have members choosing books and searching out information.

Then the blow fell. Our library had to be moved out to allow for the refurbishment of the museum. This took a lot of thought on where it could be stored and as librarian it was over to me to find a place. I have a back room where I do a lot of sewing and the double shelving in there to house all the materials was a possibility. So it was a case of putting all the fur fabric and furnishing fabrics into big plastic bags and carrying them down to my car shed. Here they took over where my trailer used to be (My son took that) piled against the outside wall and shell cabinets and covered with a sheet. After that the books had to be brought in. This took quite a bit of doing with members bringing out arm loads out of the museum and loading them into the car boots of any that could help. The only trouble was that there was only one my end and it took quite a bit of work to carry them from the car up the steps into the house. Quite a haul. Once on the shelves it was a chance to update the library records, chase overdue books and dispose of back numbers of periodicals. Now it is as up to date as I can make it.

The snag is its lack of use. There have only been two members this year that have come to use the library. It is a bit out of the way for most people, but a phone call (479-7831) would let me know what you require and I could bring books to the next meeting, or you could come here and have a cup of tea with me.

It was suggested to me the other day that I would like to get rid of the library since with the bags of materials stacked in the car shed I can no longer get to my shell collection. But that is not the point. That wouldn't matter if only the library was used. So please use it.

PERIODICALS:-

GLORIA MARIS.
Vol.36 (4) Red Sea Mollusca Parts 2-4(cont.)
Genus *Rhinoclavis* Swainson, 1840, Genus *Pirenella* Gray, 1847 (F. Potamididae) and Family Strombidae.
Conus wilsi, a new species from the Red Sea.
Vol.36 (5-6) "Contributions to the Knowledge of Strombacea.6. A revision of the subgenus *laevistrombus* Kira,1955 including the description of a new species from the New Hebrides." By L.A. Man in 'T Veld & K. de Turck. This article discusses three forms; *canarium, turturina* and a white form of *canarium* to be named *guidoi*. The anatomy of the latter has not been examined by the authers.
Vol.37 (1-3) "Neritoidea of the Solomon Islands" A. Delsaerdt.Part 2 non-marine species.

BASTERIA Vol.62, No.1-2.
Corgan and Van Aartsen: Saurin's pyramidellacean gastropod names.
Wilke and Van Aartsen: The family Pyramidellidae in the Black Sea.
Vermeij: The Systematic Position of *Tritonidea dentata* Schepman, 1911. (Buccinidae)
Marquet: Three *Cerithiopsis* species new for the Miocene of Belgium
Manganelli et al: New Hydrobiids from subterranean waters of Eastern Sardinia.
Hoenselaar and Goud: The *Rissoidae* of the CANCAP Expeditions,1: the genus *Alvania risso,* 1826.
Hutterer and Gittenberger: *Ripkeniella petrophila* gen. et spec. nov.(Gastropoda: Hygromiidae), Canary Islands.
Verdcourt: *Subuliniscus adjacens* Connolly. The first record of this Pulmonate on Mt Kenya.
Vol.62, No.3-4.
A special issue in memory of Dr.F.E. Loosjes (1913-1944)
Six articles on the *Clausiliidae (*Gastropoda, Pulmonata) family in Greece and Turkey, and some discussion of the Systematics, by Neubert, Szekeres, Gittenberger and Ripken.

TWENTY YEARS AGO

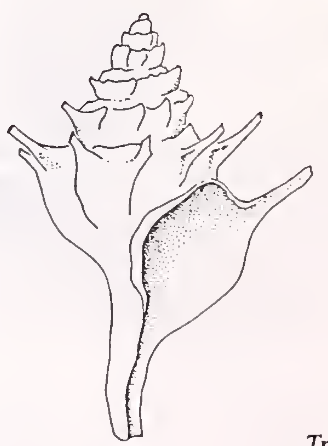
"An Elegant Trophon from Deep Water off Lord Howe Island" was illustrated. It was made available by Ken Grange from the Tangaroa collection. Tentatively identified as *c/f coulmanensis*, it resembles some of the Antarctic species, but I can't find this name in Powell or Spencer & Willan or Barry Wilson (Australian Marine Shells 1993), nor can I see an illustration that resembles it. (perhaps Bob Grange could throw some light on this?)

Cymatona kampyla, Watson 1885. This is now *Sassia kampyla kampyla* and the illustration is true to the Australian shells I have seen, with a very distinctive "twist in the tail". Mature shells are 5cm or more and are dredged from deep water off the Continental shelf.The shell has been listed in the Pakiri dredgings, but the ones I have seen have been very small and lacked the 3 dimensional backwards and sideways twist to the siphonal canal.

The late Bob Penniket reported two instances of finding large quantities (80, 200) of big clean very beautifully coloured *Chlamys gemmulata*. Both lots were living in closed up compartments of sunken ships! Something for our underwater photographers to watch for.

Derek Lamb found a *Lima orientalis* in a nest at Wenderholm. He lists 14 species of mollusc shells plus chiton valves entangled in the orange coloured threads. Of more than 100 shells 78 were *Rissoina chathamensis.*
Several other writers gave lists of shells found in various locations;- Parengarenga, Waikawa harbour, Orewa, "the Far North", Whangamata. Did anyone make a list this year?

Nancy Smith



Trophon c/f coulmanensis

POIRIERIA

Auckland Museum

Conchology Section

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CONTENTS

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The Secretary, Glen Carter, 1 Guardwell Tce, Mt Albert, Auckland, New Zealand

A PIG AND A POKE AT NORTH CAPE

Michael K. Eagle

The focus of a 4th June 1999 expedition to the North Cape Scientific Reserve was to recollect and identify fossil specimens (sessile benthic crinoids and associated marine biota) from a volcanic breccia unit previously recorded by geologists E.C. Leitch in 1966 and Dr. Fred Brook (whilst geological mapping during the 1980's), immediately north of Tokatoka Point. A secondary objective was to collect insects for identification and lodgement in the Etymology collections of the Auckland War Memorial Museum. Both collections were to be made with the aim of record and scientific knowledge; specimens to be made available for education and research.

Nancy Smith, Glenys Stace, Jocylen Carlin and Mike Eagle, by way of a four wheel-drive vehicle (with appropriate authorisation to enter Muriwhenua Incorporation lands), initially failed to gain access via Kerr Point Road and Waikuku Flat Track due to adverse track conditions. The donation of time and effort by DOC field officer D.J. Neho and the understanding and logistical generosity of Acting Field Centre Supervisor Simon Job, enabled the author only to reach the Te Kanakana Stream outlet at Waikuku Beach, and to thereby tramp to the desired collecting site north of Tokatoka Point. Tramping and collecting time was limited to one and threequarters of an hour due to logistical constraints, whilst other expedition members journeyed on to Cape Reinga and Ninty Mile Beach. It is notable that whilst staying at Spirits Bay, the unmistakable Arcid *Anadara trapezia* (Deshayes, 1839) were recovered subfossil? from the beach foreshore, near the mouth of the out-going stream.

A wild pig (*Sus scrofa*) foraging was sighted uphill south of Tokatoka Point. On approach, the animal took fright. Bracken tubers and grass roots were extensively "rooted" along the inland western crest of Tokatoka Point and on the coastal shrub strip between there and the shore outlet of Kararoa Stream. Insects collected from leaf litter collected from beneath flax (*Phormium tenax*) and manuka (*Leptospermum scoparium*) at a site located on this coastal strip are presently being curated and identified. A sole opossum (*Trichosurus vulpecula*) was encountered in manuka (*Leptospermum scoparium*). The usually nocturnal animal seemed healthy (Tb.-free), was dark-coloured, and was active when approached. The tree was amongst a stand sited inland atop Tokatoka Point. An eastern section of the erected electrified (solar-powered) opossum fence was inoperative due to "wash-out" at the Te Kanakana Stream outfall at north Waikuku Beach. A Polynesian rat (*Rattus exulans)* was seen above the high tide mark in dry leaf litter beneath a Pohutakawa (*Metrosideros excelsia*), prior to the fossil locality. The short-tailed skink (*Leiolopisma smithi*), (identified by its mainly dark brown colouration (nearly black) above; small black spots and light lateral band edged with very dark brown at the upper part of the flank; a light olive underside and short tail) was encountered "sunning" on water-worn lava boulders on the beach at the base of the Tokatoka Point cliff. No external parasite infestation (eg. mites) were observed on the animal. Various species of Asian wasp were seen at all terrane levels on both rocks and plants. No native land snails, including *Placostylis* sp. (either vacant shells or live), were seen, and no small species were in the leaf litter collected.

The author suggested to DOC that to preserve legally protected species, it would seem imperative to reactivate the eastern opposum fence soonest, so that the integrity of a the scientific reserve is maintained. Baited rat traps and pig culling should be undertaken soonest in an endeavour to eradicate predator possibility of legally protected species.

Scientific Paper Reviews

by Peter Poortman

This article contains brief reviews of a selection of scientific papers that have been published in recent years.

Copies of the original publications are held in the club library, or can be obtained from the author of the paper.

Title: **The molluscan genus *Cominella* (Gastropoda: Buccinidae) at the Three Kings Islands**

Author: R. C. Willan
(New Zealand Journal of Zoology, 1978, Vol. 5 : 437-443)

This paper describes two new species of *Cominella* from the Three Kings Islands, 56km north-west of Cape Reinga. *Cominella regalis* and *Cominella quoyana griseicalx* occur only at these islands to a depth of about 50 m. The only other *Cominella* species recorded from this region is *Cominella mirabilis mirabilis* (Powell, 1929). The absence of other *Cominella* species testifies to their limited power of dispersal and the long isolation of the Three Kings Islands.

At present there is apparently complete reproductive isolation between *C. regalis* and *C. quoyana griseicalx*. The two species are quite distinct in appearance, and despite their sympatric existence, no specimen has been found that shows even the slightest evidence of hybridisation.

Cominella regalis (n. sp.)

Shell up to 25mm.
Protoconch low, bulbous, and white.
Strong, smooth, axial ribs, 10-12 on the penultimate whorl, nodose and angular on the upper whorls.
Colour white, often with 2-3 well marked rows of square black spots.
Aperture rimmed with bright orange, white within.

Cominella quoyana griseicalx (n. subsp.)

Shell up to 20mm.
Protoconch of evenly rounded, inflated, smooth whorls, black, quite high.
Weak, smooth sloping axial ribs, 14-15 on the penultimate whorl, confined to upper half of each whorl, and not continuous to the suture.
Colour uniformly dark slate grey with occasional tiny cream specks, especially on upper parts.
Columella white with a brown blotch. Semi-transparent creamish glaze on the outer lip of adults.

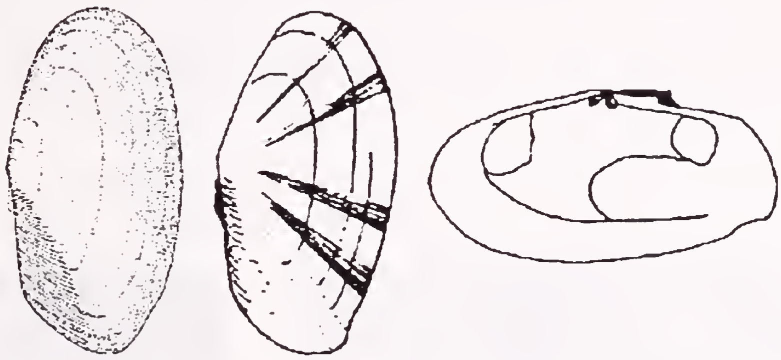
Title: **A Re-evaluation of Gari lineolata (Gray in Yate, 1835) (Bivalvia: Psammobiidae)**

Author: R. C. Willan
(Journal of the Royal Society of New Zealand, 1980, Vol. 10, No. 2, pp. 173-183)

Prior to the publication of this paper, two common and widespread New Zealand bivalves were confused under the same name, ie. *Gari lineolata* (Gray in Yate, 1835). In this paper the newly identified species is described and named *Gari hodgei*. It was subsequently synonymised with *Gari convexa* (Reeve, 1857), so for the remainder of this review I will use the correct name in place of *G. hodgei*.

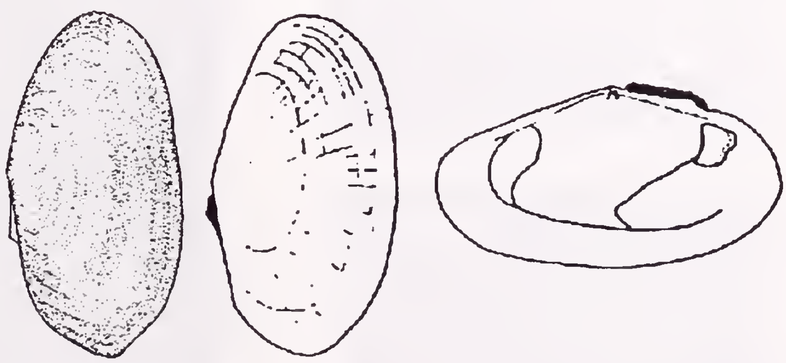
Both *G. lineolata* and *G. convexa* are common throughout New Zealand at depths of 0-75m. *G. convexa* occurs in clean, medium to coarse-grained sand often in open situations subject to current scour, whereas *G. lineolata* prefers clean, fine to medium grained sand in semi-protected localities. Greatest size is attained in the south.
These two species can be differentiated as follows:

Gari Convexa (Reeve, 1857)



Shell up to 85 mm long, moderately heavy. Right valve convex, left valve flattened.
Right valve has a ridge extending from the umbo to the posterior margin, with numerous fine raised lirae on the posterior slope. The lirae do not extend onto or beyond the ridge.
Colour reddish-orange with concentric zones of pink, purple, cream, and red, frequently interrupted by white or pink radial rays that originate from the umbones. Umbones white. Live shells with a thin, greenish-brown periostracum.
Interior purplish-white, faintly nacreous. Deep U-shaped pallial sinus. Umbo towards the posterior end of shell.

Gari lineolata (Gray in Yate, 1835)



Shell up to 60 mm long, relatively light. Left and right valves equally convex.
Ridge on the right valve is weak or absent. Posterior slope smooth.
Colour pinkish-red, often with concentric darker or lighter zones but never any rays. Umbones purplish.
Interior pinkish and lustrous. Less extensive pallial sinus. Umbo central.

Title: **Analyses of tuatua populations - Paphies subtriangulata and P. donacina**

Author: J. R. Richardson, A. E. Aldridge, P. J. Smith
(New Zealand Journal of Zoology, 1982, Vol. 9 : 231-238)

The taxonomic classification of our common tuatua has in the past been a difficult subject. Powell's *'New Zealand Mollusca'* (1979) records three subspecies, ie. *Paphies subtriangulata subtriangulata, Paphies subtriangulata porrecta,* and *Paphies subtriangulata quoyii*. Later it was determined that *P. subtriangulata porrecta* was in fact a synonym of *Paphies subtriangulata* (Gray in Wood, 1828), and that *P. subtriangulata quoyii* was a synonym of *Paphies donacina* (Spengler, 1793).

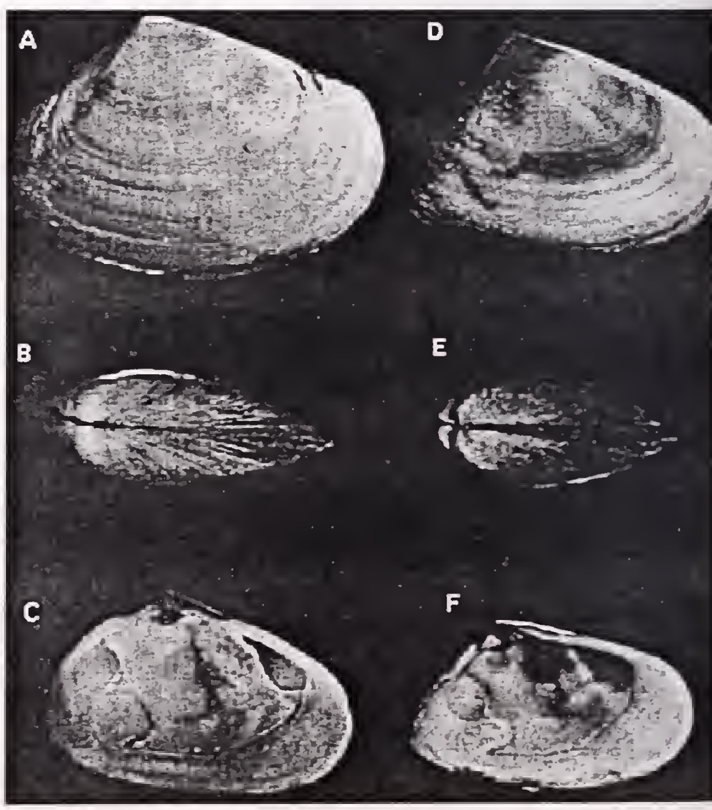
This paper documents an investigation into whether *Paphies subtriangulata* and *Paphies donacina* are indeed seperate species, or simply the same species occuring in geographically seperate forms (ie. subspecies).

The ranges of *P. subtriangulata*, predominant in the north, and *P. donacina*, predominant in the south, overlap. The two species occur in roughly equal numbers in the same beds on sandy beaches around the Wellington area. By analysing the shell characteristics of a large number of specimens from some of these beaches it was found that there was no intergrading. A formula for identifying the shells using various measurements is provided in Appendix 1 of the paper. Another technique called electrophoretic analysis was used to determine that each species had a distinctly different esterase make-up.

The investigation proved conclusively that no interbreeding was occuring between *P. subtriangulata* and *P. donacina*, thereby confirming their status as distinct species. It also proved that these species are easily distinguished, without the need for mathematical formulas or biochemical analysis, by checking the following attributes.

Paphies donacina **(Spengler, 1793)**
Shell flat and ovate, colour cream, never with algal and hydroid growths.
Cream adductor muscles, pallial line curved.
(Figs. A, B, C)

Paphies subtriangulata **(Gray in Wood, 1828)**
Shell thicker and more posteriorly truncated, colour grey, sometines with algal and hydroid growths, sometimes without.
Blue adductor muscles, pallial line flattened.
(Figs. D, E, F)



Title: **Deep-sea Gastropods from the New Zealand Region Associated with Recent Whale Bones and an Eocene Turtle**

Author: Bruce A. Marshall
(The Nautilus 108(1):1-8, 1994)

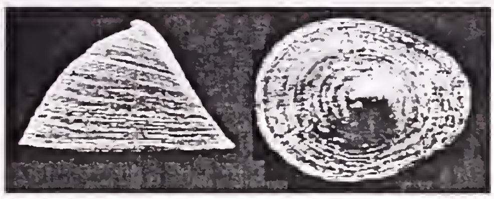
Gastropods were first recorded living in association with decaying whale bones with the discovery of *Osteopelta mirabilis* (Marshall, 1987). Since then, a number of additional species have been discovered living in this unusual habitat in other parts of the world. Some of these species were originally known from hydrothermal vents, and similarities have been found between species associated with decaying whale bones, hydrothermal vents, and hydrocarbon seeps. It has been suggested that whale skeletons may provide stepping stones for the wide dispersal of deep-sea chemosynthetic communities.

This paper describes four new species living in association with decaying whale bones in deep water off New Zealand. It also records a range extension for the following two species.

Paracocculina cervae (Fleming, 1948)
North Cape to the Auckland Islands, 18-891m on sunken wood, algal holdfasts, and whale bone.

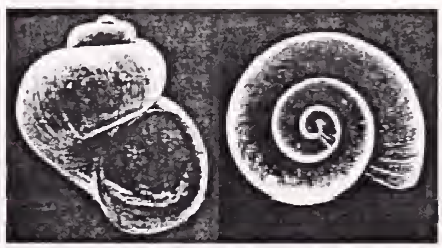
Osteopelta mirabilis (Marshall, 1987)
Challenger Plateau and Chatham Rise, on whale bone, 800-955m.
This or a closely similar species has been found in close association with fossil turtle bones from the Middle Eocene of New Zealand.

Osteopelta praeceps (n. sp.)
Chatham Rise and Challenger Plateau, on whale bone at 372-912m.
Shell up to 6.25mm long, translucent white, thin and brittle. Periostracum transparent, very thin and smooth. This species differs from *O. mirabilis* in being smaller and in having a narrower, taller shell with a longer anterior end.

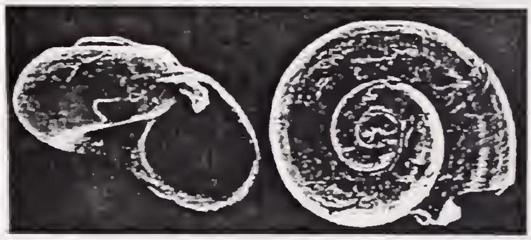


Bruceiella laevigata (n. sp.)
North-east of Chatham Islands, on whale bone at 1242m.
Shell up to 1.70mm high, thin, translucent, glossy, with a narrow umbilical chink. Periostracum smooth. Compared with the type species, this *B. laevigata* is more tightly coiled with a higher spire.

Bruceiella pruinosa (n. sp.)
Challenger Plateau, on whale bone at 908-912m.
Shell up to 1.43mm high, identical to *B. laevigata* except in having a teleoconch sculpture of minute granules and fine axial wrinkles. These two species are primarily differentiated by animal anatomy.
[photo]



Xylodiscula osteophila (n. sp.)



Off Mernoo Bank, Chatham Rise, on whale bone at 900m.
Shell 1.60mm wide, thin, translucent, colourless, umbilicate, periostracum smooth.
This species and the previous two *Bruceiella* species are the first record of coiled gastropods living on whale bone. Other *Xylodiscula* species have previously been associated with sunken wood and old sea grass. Most recently a *Xylodiscula* species was recorded from a hydrothermal vent at 2000m north of Fiji.
[photos 15,16]

Title: **_Zygomelon zodion_, A New Genus and Species of Bathyal Volute from New Zealand**

Author: M. G. Harasewych and Bruce A. Marshall
(The Veliger, 38(2):145-151, April 3, 1995)

This paper describes a new volute that was discovered from deep-sea dredgings off south-eastern New Zealand in 1979. With a bathymetric range of 734-1386m, it is the deepest-living volute known from the New Zealand region. Based on a combination of conchological and anatomical features it has been allocated a new genus under the subfamily *Zidoninae* (Pilsbry and Olsson, 1954).

Because the species *Pachymelon suropsilos* (Stilwell & Zinsmeister, 1992) has evidence of only two columellar folds, it too has been referred to the new genus *Zygomelon*. This species occurs in the late Eocene of Seymour Island, Antarctica, and differs from *Zygomelon zodion* in being bigger and having a proportionately larger aperture.

Zygomelon zodion (n. sp.)

Shell stout, up to 50.2mm in length.
Protoconch large, of less than two smoothly rounded whorls.
Outer lip smooth, porcellaneous, thin, not flared.
Columella with two columellar folds set obliquely to the siphonal fold.
Colour greenish tan, with a yellowish tan to brown aperture. Periostracum thin and yellowish.
Operculum absent.

Title: **A Review of the New Zealand Recent Species of _Poirieria_ Jousseaume, 1880 (Mollusca: Gastropoda: Muricidae) with Description of a New Species**

Author: Bruce A. Marshall and Roland Houart
(THE NAUTILIS 108(2):27-33, 1995)

This paper reviews the New Zealand Recent species of *Poirieria*, and introduces a new species to this genus. *Poirieria syrinx* differs from the well known *P. zelandica* and the rare *P. kopua* primarily in having tubular shell spines. A related species *Trophon carduelis* (Watson, 1883) is also introduced to the Recent fauna of New Zealand. This species occurs off the North Island and the west coast of the South Island at 676-1217m.

New Zealand *Poirieria* species are similar to the European *Trophon echinatus* and a number of Indo-West Pacific species that are mostly undescribed. The Caribbean type species of *Paziella* and *Actinotrophon* are both very similar to New Zealand *Poirieria* species and are regarded as subgenera of *Poirieria*.

Poirieria zelandica (Quoy & Gaimard, 1833)

This well known species is common at depths of 20-150m throughout New Zealand, however small specimens occur occasionally at depths of up to 540m.
Shells can attain a length of up to 65mm off northern New Zealand and reduce gradually to about half this size at the southern end of the country. Protoconch size is 0.9-1.0mm.
There is considerable variation in the length of the spines which tend to be longest in specimens from muddy substrata, and shortest in specimens from coarser substrata.
Fossils occur from the Early Pliocene (Opoitian) period and are generally larger, thicker shelled, and more dentate than the Recent species.

Figure 1 - Variations of Poirieria zelandica.

Poirieria syrinx (Marshall and Houart, 1995)

Found at depths of 400-800m off the North Island, and also in the early Pleistocene (Nukumaruan) fossil beds at Palliser Bay.
The shell is smaller (up to 45mm) than *P. zelandica* but the protoconch (1.2mm) is larger. The most noticeable difference between these species is that *P. syrinx* has fully tubular spines that are set further behind each varical rim.
Other shell differences include the more prominent spiral microlirae on the shell surface, and the lack of spiral swellings between the bases of the spines.

Poirieria kopua (Dell, 1956)

This rare species occurs at depths of 500-1000m off the east coast of the South Island and on the Chatham Rise.
The shell differs from *P. zelandica* and *P. syrinx* in being smaller (up to 19mm), having a larger protoconch (1.5-1.7mm), and in lacking secondary spines below the peripheral spine.

Snorkelling Noises

Margaret S. Morley

SUMMARY

A description of snorkelling west of Otata Island, Noises Islands, Hauraki Gulf is given including comments on the tube worm *Chaetopterus* and the micromollusc *Awanuia*. A species list of 68 molluscs, (6 chitons, 43 gastropods and 19 bivalves) is included.

OTATA ISLAND, NOISES ISLANDS

The group of islands composed of greywacke, known as The Noises, lie 8km north of Waiheke Island in the Hauraki Gulf. Otata Island is the largest of the group (Fig. 1). Extending west from the north side of Otata is an intermittent series of rocks joining the main part of the island to a much smaller island. This reef is almost totally submerged at high tide but at low tide it becomes partly exposed. In light northerly winds it affords an anchorage on its south side for boats in depths of 7-8m. Care has to be taken as the rocky bottom does not give good holding and the anchor can get fouled among rocks.

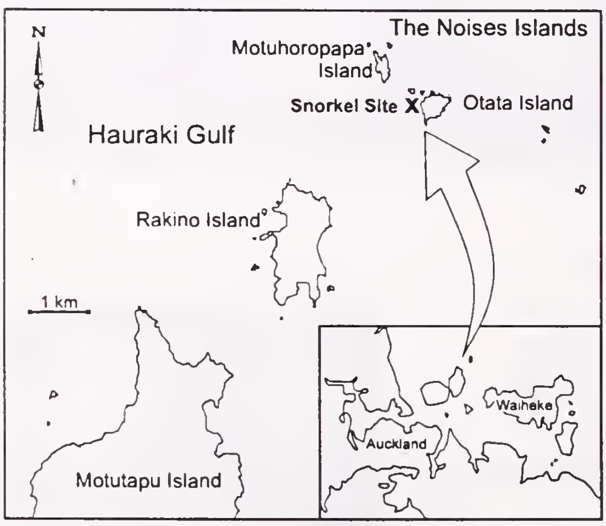


Fig. 1 Snorkel site Otata Island, Noises Islands.

When the right northerly wind and tide combinations occur it is one of my favourite snorkelling spots. My husband Con and I take about 2-4 hours to sail from the yacht moorings in the Tamaki Estuary to Otata Island. The outgoing tide is of great assistance throughout the sail there while the incoming tide helps on the way home.

The water visibility is about 6m. The area has a rocky base and many turnable rocks occur down to depths of 4-5m. There is a strong tidal flow from north to south as the tide turns to come in. There is very little silt although some of the rocks rest on coarse shell fragments. Much of this gravel is pink being composed of the plates of the barnacle *Balanus tintinnabulum*. These barnacles live on the upper surface of the rocks. The rocks themselves are clad in bright tones of a calcareous pink algal paint. Numerous cat's eyes *Turbo smaragdus* graze over the surface. Specimens of the limpet *Patelloida corticata* are well camouflaged in their covering of pink paint. A rich fauna of sponges, bryozoans, brittle stars, kina and molluscs live under the boulders. There are big populations of the slipper shells *Crepidula costata* and *Sigapatella novaezelandiae*. On some of the reef rocks large expanses of the orange sponge *Clione celata* make dramatic colour patches. At times I have seen vast regiments of tightly packed green-shell mussels *Perna canaliculatus* , however on the last trip on 23 March 1999, even single specimens were hard to find.

At the tip of the smaller island are more rock stacks with gullies between, about 4-5m deep. This is the habitat for the top shells *Calliostoma tigris* and *C. punctulatum*. They are often on or near the patches of sponge. It is also worth snorkelling down to look under ledges as *C. tigris* seems to like living upsidedown. While you look in, shoals of curious big eye fish may be looking out at you. Sometimes a selection of empty shells are laid out around an octopus lair. Large parori flee at the approach of a diver, but leather jackets are more friendly and even appear to enjoy a game of hide and seek.

The visual delights of a snorkel here are many, but much is only discovered by

specialised collecting of microscopic shells found in material against the underside of the rocks. This is quite a tricky task underwater with a current! Good results seem to be obtained by holding a bag close against the rock and sweeping everything towards the bag. Of course you never know what you missed! A different group of shells live in the sediment under the rocks, so I also scoop up handfuls of this to look at later. Algal grazers are collected by taking strands of living algae. These are washed later and shells in the sieved sediment picked under the microscope.

SNORKEL 23 MARCH 1999
***Chaetopterus* sp.**
During my snorkel I noticed under several rocks a large tube worm encased in a thick leathery jacket with particles of gravel attached (Fig. 2). I took two specimens for the Auckland War Memorial Museum collections.

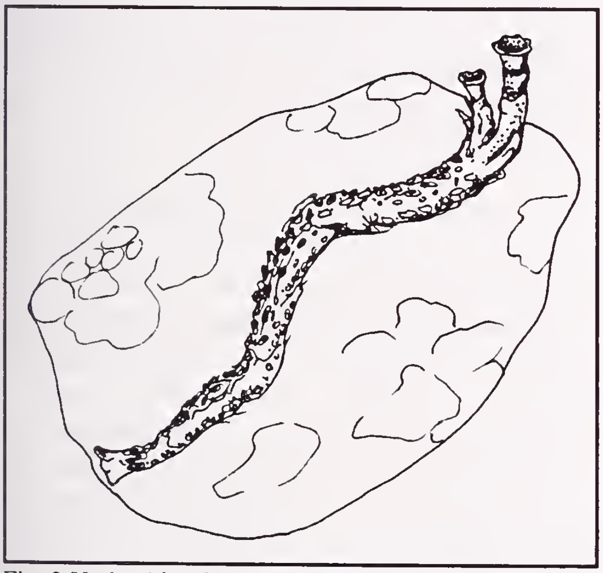


Fig. 2 Underside of rock showing *Chaetopterus* sp. in situ, length 25cm.

A *Chaetopterus* sp. was described as living in a U shaped tube below low tide in soft muds or attached to hard substrates such as gravel and the top of horse mussels *Atrina zelandica* (Morton & Miller 1968).

In a Herald article on 27 July 1998, John Walsby discusses the large numbers of empty leathery tubes washed up on the Auckland east coast. He identified the worms as *Chaetopterus* and confirmed that this is a well known worm not a recent introduction. He drew it in a U-shaped tube in soft sediments. Soon after finding the worm living under the rocks at the Noises, I found a big population at Matakakia Beach on the Whangaparaoa Peninsula. These were living in three different habitats, dense beds at extreme low tide lying horizontal attached to the sandstone rock platform covered by 15- 20cm sand; some living under slabby rocks across the causeway and some living at mid tidal level within the *Corallina officinalis* turf on the small offshore island. *Chaetopterus* was not living in areas of deep sand. Regular shell collectors who frequent beaches cannot recall seeing previously either large numbers of tubes washed up or finding worms in situ.

Wilma Blom who is studying these worms, has sent specimens to an expert in Denmark for identification. Wilma would appreciate detailed information on the locality and substrate of any *Chaetopterus* you may find. She can be contacted at 17 West Lynn Rd., New Lynn, Auckland or ☎ 827 8401.

My "long worm story" goes as follows, back on the boat I couldn't resist splitting one of the tubes to watch the live worm. Minus its tube after several minutes of vigorous pumping it soon began to look seedy so I preserved it in meths. The second worm I kept alive with *frequent* changes of sea water. Back home the worm was put in my aquarium while I found out from Wilma how to obtain a good specimen for dissection by narcotising it using epsom salts, so I did that, however, (you've guessed it) when I split open the tube as a final check before preserving the worm there was nothing inside!

ACLIDIDAE
***Awanuia porcelana* Ponder, 1967 (Fig. 3)**
Awanuia has been transferred from Rissiodae to Aclididae (Spencer & Willan 1996).

This attractive microscopic shell was an unexpected find alive in shell gravel taken from under rocks at the Noises. Its measurements are height 2.5mm and width

1.0mm. The two species *A. dilatata* and *A. porcelana* are both rare. The distinguishing features are the number of whorls, four and a half in *A. dilatata*, six in in *A. porcelana* and a spiral cord on the shoulder of all whorls and no radiating riblets with the aperture in *A. porcelana* (Ponder 1967, Powell 1979).

It appears likely that specimens of *A. porcelana* recorded in Powell (1979) found in shell sand were dead. Live taken specimens of *A. dilatata* were dredged in Auckland Harbour and Northland east coast in depths of 10-20m. My Noises specimen appears to be the first live taken specimen of *A. porcelana* recorded in shallow water of 1m. Because I had difficulty deciding on the species of the Noises specimen I decided to examine more specimens.

Specimens examined

1. Holotype of *A. dilatata* Powell, 1927 Auckland War Memorial Museum collections AK 72014.
Powell (1927) describes the *Awanuia* protoconch as large and tricarinate but the holotype has no protoconch now and the rest of the shell shows moderate chemical deterioration. I could not see the faint riblets in the aperture. The holotype is 1.5mm in height.

2. Holotype of *A. porcelana* Ponder, 1967 Auckland War Memorial Museum collections AK 72965.
The holotype of *A. porcelana* measuring 2.4mm in height is larger than the holotype of *A. dilatata* but the proportions when calculated, axials and other features appear to be the same. The spiral cord on the shoulder of the whorls is no more prominent than on *A. dilatata*.

3. I have five specimens of *Awanuia* in my collection. Their locations are one from Bland Bay, two from Rarawa, east coast Northland and two from shell sand at the Poor Knights. These specimens do not clearly separate into two species. Some of my specimens have six whorls, the larger size of *A. porcelana* but no spiral cord on the shoulder of the whorls. Some of my specimens with the size of *A. dilatata* have no radiating riblets in the aperture. This feature is variable and is not a reliable distinguishing feature as the riblets only develop in mature specimens (Norm Gardner pers. comm.).

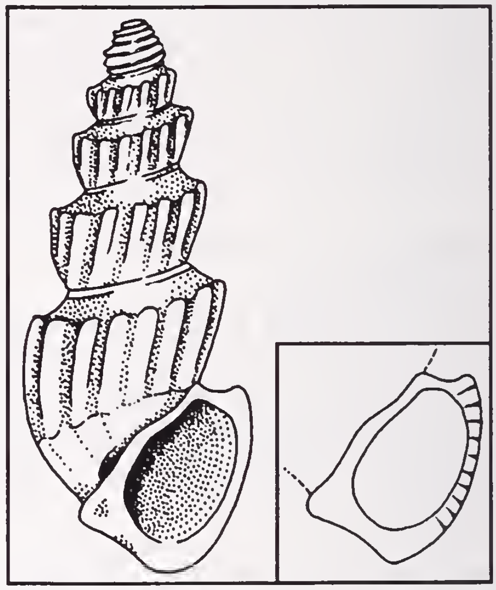


Fig. 3 *Awanuia dilatata* Poor Knights specimen, (Richard Willan collection), height 2.5mm; inset - aperture of Whatuwhiwhi specimen showing riblets (Anne Randall collection).

4. I have examined a freshly dead specimen of *A. dilatata*, height 2.5mm, sorted from bryozoan rubble, depth 18m, South Harbour, Aorangi Island, Poor Knights Islands from Richard Willan's collection; also a specimen of *A. dilatata* from shell sand at Whatuwhiwhi, Northland east coast, from Anne Randall's collection. Both specimens are of similiar size, proportions and features but the Whatuwhiwhi specimen shows distinct riblets in the aperture (Fig. 3, inset). Both specimens although identified as *A. dilatata* are of large size and have six whorls.

Conclusions
The distinguishing features of size, number of whorls, radiating riblets and a spiral cord on the shoulder given by Ponder (1967) for *A. porcelana* do not clearly separate all specimens into two species. It appears from the specimens examined that there is one species not two and it should be called *A. dilatata*.

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ACKNOWLEDGEMENTS

Many thanks to Norman Gardner, Anne Randall and Nancy Smith for loan of *Awanuia* specimens; to Auckland War Memorial Museum for access to the types, to Norm for sharing his information; to Hugh Grenfell for assistance in producing the map and formatting and to Bruce Hayward for suggesting improvements to the text and the stylish title!

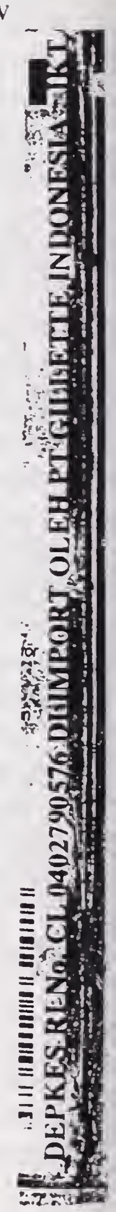
Species List Otata Island, Noises Islands, 23 March 1999

Polyplacophora
Callochiton crocinus
Ischnochiton maoriana
Onithochiton neglectus
Plaxiphora violacea
Rhyssoplax stangeri
Rhyssoplax aerea
Gastropods
Amphthalamus falsestea
Anabathron hedleyi
Anabathron ovatus
Anabathron rugulosus
Awanuia porcelana
Bittium exile
Caecum digitulum
Calliostoma punctulatum
Calliostoma tigris
Ceratostoma amoena
Cominella maculata
Cominella quoyana
Cominella virgata
Crepidula costata
Crepidula monoxla
Dendrodoris citrina
Eatoniella notalabia
Eatoniella olivacea
Eatonina micans
Herpetopoma bella
Homalopoma fluctuata
Linopyrga rugata
Merelina crosseaformis
Merelina taupoensis
Onoba fumata
Patelloida corticata
Pisinna rekohuana lactorubra
Pisinna zosterophila
Risellopsis varia
Sigapatella novaezelandiae
Siphonaria australis
Rissoina chathamensis
Sagenotriphora ampulla
Scissurella stellae
Sigapatella novaezelandiae
Sinuginella cairoma
Thoristella oppressa
Trochus tiaratus
Trochus viridus
Tugali suteri
Turbo granosa
Turbo smaragdus
Zemitrella choava
Bivalves
Anomia sp.
Chlamys zelandiae
Dosina zelandica
Felaniella zelandica
Gari stangeri
Hiatella arctica
Irus reflexus
Kellia cycladiformis
Limaria orientalis
Modiolus areolatus
Neolepton antipodum
Nucula nitidula
Perna canaliculus
Pododesmus incisura
Pseudarcopagia disculus
Ruditapes largillierti
Tawera spissa
Trichomusculus barbatus
Tucetona laticostata
Polychaeta
Chaetopterus sp.

A LOAD OF RUBBISH

Michael K. Eagle

Northland is renowned for its beaches. They come in many shapes and sizes and vary from shingle and boulder beaches to shelly and sandy shores. A recent trip to Spirits Bay and North Cape Scientific Reserve, along both sandy and rocky shorelines, revealed a variety of beachdrift at the high-tide mark. Most beachdrift was formed plastic of one kind or other. Plastics and capped glass bottles were often encrusted with marine animals such as barnacles (stalked and fixed), hydroids, and encrusting bryozoans. Many items were discoloured and abraded due to prolonged exposure to the elements and had perhaps travelled great distances and spent a long time afloat (evidential by the proliferation of animal growth upon them). A point of origin was sometimes available, either as an attached label, writing inscribed on the object, or labelled contents within a sealed container! It is presumed that the majority of the following articles are flotsam jettisoned either accidently or purposely from shipping. New Zealand items may simply be litter.



SPIRITS BAY

ITEM	COUNTRY OF ORIGIN	MADE OF
Gillet aerosol shaving can	Indonesia	metal
capped milk bottle 2L x2	New Zealand	plastic
soft-drink bottle x2	Indonesia	plastic
jerry can 4L	Australia	metal
heavy duty container 20L	Korea	plastic
cupboard/door handles	?	plastic
Johnny Walker Whisky bottle 1.5L	?	glass
fishing net - off-cut 40 mm sq	?	polyester
green rope - small length	?	polyester
baling twine (green) - small length	?	polyester
blue strapping - small length	?	plastic
Aspro container with tablets	England	plastic
crate (broken)	Taiwan	plastic
bucket 2L blue (broken)	?	plastic
soft-drink bottle	Saudi Arabia	plastic
can six-pack wrapping	?	plastic
light-bulb	Korean	glass/metal
fish bin (broken) (Talleys)	New Zealand	plastic
various lengths of rs & mg wood	?	wood
capped sauce bottle	Japan	glass
heavy glove	Japan	rubber
Fishing buoy	?	polystyrene
insulation sheet	?	polystyrene
plastic granules	?	plastic
wooden crate (Chep)	Australia	wood
tyre (Bridgestone)	New Zealand	rubber

NORTH CAPE SCIENTIFIC RESERVE

fishing buoy	Japan	plastic
mg. wood lengths	?	wood
capped cooking oil bottle	Indonesia	glass
bracket on board	?	wood/plastic
white oil drum 10L	Korean	plastic
soft-drink bottle	New Zealand	plastic

Some of these articles are an eco-danger to both marine and terrestrial fauna. Where practicable, a collection of the smaller items was made and the rubbish disposed of responsibly.

INTERTIDAL SURVEY OF PIHA AND MERCER BAY, WEST COAST OF AUCKLAND, JANUARY TO MARCH 1998

Margaret S. Morley and Bruce W. Hayward

SUMMARY

An intertidal survey of Piha and Mercer Bay resulted in a species list of 61 molluscs (8 chitons, 32 gastropods, 19 bivalves, 2 cephalopods), 4 echinoderms (kina, snapper biscuits, cushion stars and sea stars), 19 crustaceans (crabs, shrimps and barnacles), 2 ascidians (sea squirts), 9 coelenterates (including 7 anemones), 6 sponges, 7 marine worms, and 18 algae.

INTRODUCTION

The local Piha community have been concerned for a number of years that increasing numbers of people collecting for food are causing serious depletion of the shellfish and intertidal biota at Piha. In 1995 over 70 people could sometimes be counted harvesting at low tide. If each person collected what was the quota then 70,000 shellfish could be taken in just 10 days! A voluntary collecting ban was set up in December 1997. A roster of residents patrol three key areas of the beach at every low tide during the summer season and at long weekends, and less frequently in the winter. There are designated watch houses which respond to anyone seen collecting on the beach. Would-be collectors are approached in a friendly non-confrontational way. Residents then explain why they feel marine life should not be harvested and hand out pamphlets. There is generally a favourable response and some visitors even explain the voluntary ban to the next group!

By 1999 it is being noticed that fewer visitors come with the intention of collecting. The latest notice erected on the Piha Road includes Whites Beach and Anawhata in the voluntary ban . A recent poll shows 98% of Piha residents support the ban.

A qualitative assessment of rocky shore marine life at Piha Beach was written as a report to the Ministry of Fisheries (Grace 1997). An assessment and comment on this report was written by a North Piha resident (Astley 1997).

The survey of Piha presented here was requested by Piha community spokesperson Rob Astley. Mercer Bay, 2 km south of Piha, was chosen as representative of a relatively uncollected beach with similar habitats to Piha. The areas surveyed were North Reef, Lion Rock, South Piha and Mercer Bay (Fig. 1) during a total of four visits of about three hours each at spring low tides from January to March 1998. Ten members of the Conchology Section of the Auckland War Memorial Museum assisted in data collection at Lion Rock and South Piha. These two areas are combined in the species list.

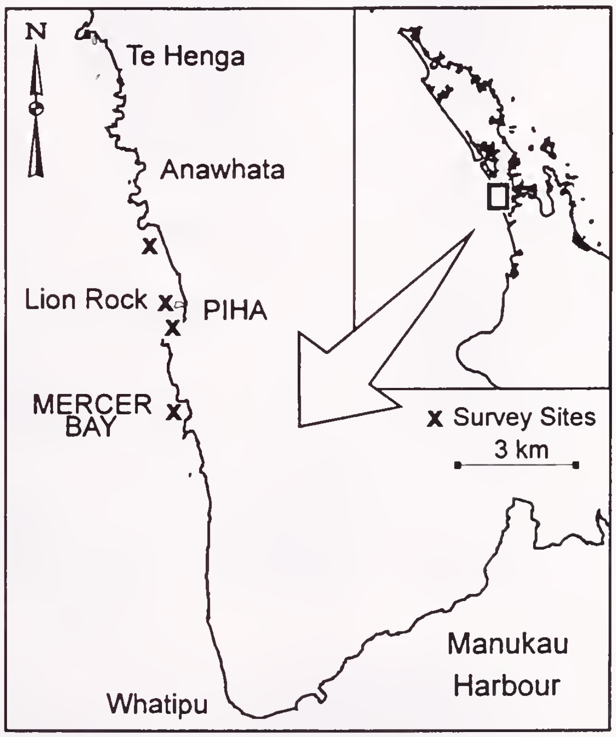


Fig.1: Survey sites at Piha and Mercer Bay.

A subjective scale of abundant, common, frequent, occasional and rare is used for specimens seen alive. Specimens found dead are listed but not quantified.

Species recorded at Piha in Morton and Miller (1973) and specimens in the Auckland War Memorial Museum collections are included in the list.

Mollusc names are updated to Spencer and Willan (1996).

NORTH PIHA 2 JAN 1998

No green shell mussels *Perna canaliculus* were living on mid to low tidal rocks except for a few scattered juveniles (length 25-35mm) which occured in crevices towards low tide. Just below low tide, adult *P. canaliculus* were clinging to the rocks in dense mats together with numerous predatory sea stars *Stichaster australis*. The mussel beard *Amphisbetia bispinosa* grew from many of the mussels. The intertidal rocks were colonised by numerous little black mussels *Xenostrobus pulex* and the surf barnacle *Epopella plicata*. Isolated clusters of small, white rock shells *Dicathais orbita* were present. Egg cases were rare.
The barnacles *Chaemosipho brunnea* and *C. columna* were abundant on high tidal rocks.

In the partly sheltered boulder gully immediately to the north of the North Reef, medium-sized cat's eyes *Turbo smaragdus* were present in low numbers in inaccessible places on the sides of shaded boulders. Moderate numbers of the oyster borer, *Lepsiella albomarginata* were present, feeding mainly on the barnacle *Epopella plicata*. The dark slug *Onchidella nigricans* was frequent on shaded rock surfaces. At mid tidal level the small dark limpets, *Notoacmea parviconoidea* were living on rock surfaces among the barnacles *E. plicata* and *Chaemosipho columna*. Patches of the calcareous tube worm *Pomatoceros caeruleus* were attached to rocks at mid tidal level while the sand tube worm *Sabellaria kaiparaensis* formed friable masses at the junction of the rock and sand. A few limpets *Patelloida corticata* were living in rock pools where they were well camouflaged by their covering of pink algal paint. A few individual specimens of the Pacific oyster *Crassostrea gigas* were cemented to low tidal rock faces.

The tufted chiton *Acanthochitona zelandica* was living hidden in rock crevices. The snakeskin chiton *Sypharochiton pelliserpentis* was frequent intertidally. The larger chiton *Plaxiphora obtecta* was also frequent towards low tide.

Surprisingly only one crab was seen at this location and this moved too fast for identification. In 1999 a crab count by residents showed that since this survey the purple shore crab *Leptograpsus variegatus* has made a come back. Numbers are up, mostly immature crabs. Six people collecting within the legal current quotas could wipe out this emerging population in one day (Rob Astley pers. comm.). Rob also feels that the remnants of the *P. canaliculus* population would have disappeared without the protection of the voluntary ban.

Five species of anemones were present, the dark red anemone *Isactinia tenebrosa* on shaded high tidal rocks, the olive green *Isactinia olivacea* in mid tidal crevices, the large variously coloured *Isocradactis magna* in low tidal pool crevices, the jewel anemone *Corynactis haddoni* on overhanging rock at extreme low water and the pale anemone *Actinothoe albocincta* in dark crevices.

High tidal level on top of the North Piha Reef

Sparse, small specimens of the sea lettuce *Ulva lactuca* were present. These appeared to be recent growth, which may have been due to seasonal changes, but considerable quantities were harvested during the summer (Rob Astley pers. comm.). Other organisms included a few specimens of the radiate limpet *Cellana radiata,* rare *Siphonaria australis,* the ornate limpet *C. ornata* and the algae *Microcoleus lyngbaea*. The blue and white periwinkles *Nodilittorina antipodum* were common on rocks at extreme high tide.

At and below low tidal level

Species of brown algae fringed the rocks, but the bull kelp *Durvillaea antarctica,* usually a dominant species swirling in wave surges, was absent. Sheets of flat bright orange and red sponges and occasionally the sponge *Tethya ingalli* appeared on the rocks through the wave troughs. The small brightly coloured top shell *Cantharidella tesselata* was common among the algae and *P. canaliculus.*

Algae species were not collected for more detailed identification from this site.

SOUTH PIHA AND LION ROCK
28 March 1998

Ten members of the Conchology Section of the Auckland Museum contributed data. Members searched by climbing around the perimeter of Lion Rock at sea level and visiting the southern end of Piha.

In addition to chiton species found at North Piha, the chitons *Eudoxochiton nobilis Cryptoconchus porosus*, and *Plaxiphora biramosa* were rare on low tidal rocks.

The limpets *Cellana ornata* and *C. radians* were larger and more numerous than at North Piha, especially on the ocean side of Lion Rock. There was also a noticeable increase in size and numbers of *Dicathais orbita*. A few grazing micromolluscs were found on algae. Many tiny bivalves *Gaimardia finlayi* were attached strongly by byssal threads to the narrow red algae *Osmundaria colensoi*. Another bivalve *Philobrya munita* was living at the base of this alga near the holdfast. The small irregular bivalve *Hiatella arctica* was living under algal holdfasts.

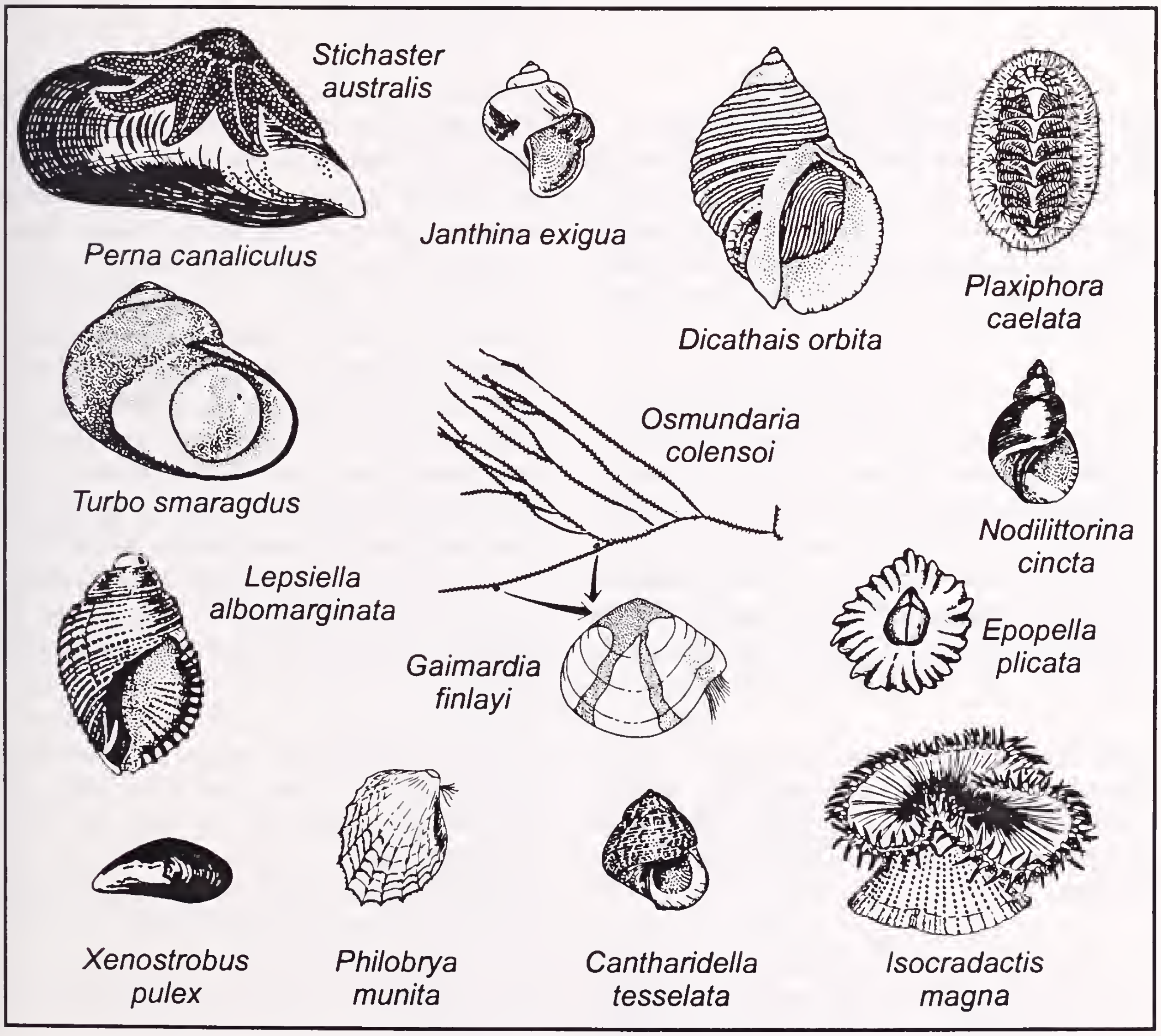


Fig. 2 Common or typical Auckland west coast species. Several illustrations are from Powell (1947).

The periwinkle *Nodilittorina antipodum* was common and the larger brown periwinkle *N. cincta* was frequent at a slightly higher tidal level. The numbers and size of *Turbo smaragdus* were greater than at North Piha. The green shell mussel *P. canaliculus* was also more numerous than at North Piha but nowhere abundant.

On the southern side of Lion Rock the small buccinid *Buccinulum vittatum* was living under rocks in deep intertidal pools. The sand tube worm *Sabellaria kaiparaensis* formed masses at low tidal level in gullies.

All the bull kelp *Durvillaea antarctica* had gone, leaving behind their holdfasts still attached to the rocks in a low tidal zone of pink Corallina paint covered "desert". Many dead Durvillaea fronds were washed up on the beach.

MERCER BAY
2 January& 27 February 1998

This beach is only accessible by boat during calm weather or by an hour's walk which includes a steep cliff climb. The hardy, dedicated collectors who harvest Mercer Bay mainly take *Perna canaliculus* (Rob Astley pers. comm.).

The beds of *P. canaliculus* extended in continuous dense sheets from mid tidal rocks down to below low water with the exception of several patches of denuded rock in the middle of *P. canaliculus* beds possibly due to being collected by people or being dislodged by storms (Grace 1997). The small topshell *Cantharidella tesselata* was common on low tidal rocks and algae.

Dicathais orbita was in much greater abundance and larger than specimens at Piha. Many were egg laying in groups. The chiton *Plaxiphora obtecta* was more numerous than at Piha.

On the first visit on 2 January bull kelp *Durvillaea antarctic* was prolific at low tide, but on the second visit on 27 February many rotting holdfasts still attached to the rocks were all that remained. The long thick fronds were washed up to rot at high tide. Just south of the sandy beach at Mercer Bay is an extensive area of large boulders offering a slightly less exposed habitat. Large specimens of the top shell *Melagraphia aethiops* were frequent. Also in greater numbers than at Piha were the small half crab *Petrolisthes elongatus* where they were living among the abundant *P. canaliculus* (Astley 1997). Kina *Evechinus chloroticus* and the cushion star *Patiriella regularis* were occasionally present. An octopus showed at the entrance to its lair between rocks at extreme low tide.

DISCUSSION

The sustainability of the marine life on the west coast of Auckland is seen as a top prirority to many residents and conservationists.

A rahui (no take) and regulatory closure has been in place at Karekare, south of Piha, since 1992, but frequent monitoring has shown that the popular edible species such as greenshell mussels are not recovering their former numbers. At North Piha areas of rock previously covered by *Perna canaliculus*, but removed by collectors, are now colonised by barnacles and little black mussels (Morley pers. obs.). At the end of the life span of these species will the *P. canaliculus* get a chance to recolonise? Are other *P.canaliculus* close enough or numerous enough to provide the necessary spat? How long might it take? It has been found that in addition to harvesting, a variety of natural factors such as storms and shifting sand levels affect the fauna (Grace 1997).

As well as individual studies an overview of the fauna of the whole coast is important. The Ministry of Agriculture and Fisheries did an intertidal survey including locations on east and west coasts (MAF 1992). More recently on May 29 1999 the Ministry of Fisheries did an aerial photographic survey of the Waitakere coast. The results of this are not yet available.

The abundance of the fauna at Piha has declined dramatically since the 1950's (John Morton pers. comm.). There is a lot of study still to be done. There is a danger that if decisions on banning collecting are left in the too hard basket for too long, many of the remaining wondrously rich habitats that delight us now may not be there for future generations.

A serendipidous result of these surveys was the documentation of the complete die-off of bull kelp, not only at Piha and Mercer Bay, but also right along the Waitakere Coast (pers. obs.). The demise of the bull kelp coincided with unusually raised sea temperatures on the North Island west coast which were 1-3 degrees higher than average during January and Febuary 1998 (M. Uddstrom pers.comm.).

A similar die-off is remembered by local residents once in the 1960's, presumably, also caused by much warmer water that year. Revisits to Lion Rock showed that by July 1998, numerous young bull kelp plants had recolonised and grown to 0.3-0.5m straps.

In June 1999 the bull kelp beds in the gut at South Piha were only a remnant of their former abundance (Morley pers. obs.). About twenty scattered individual plants survive, they have thin straps with a maximum length of 1m. A few years ago the surface of the water in the gut was totally covered with thick straps of bull kelp several metres long.

Molluscs found elsewhere, in small numbers on the Waitakere's rocky coast but not found during these surveys include: *Buccinulum linea, Cominella maculosa, C. accuminata, Diloma arida, D. coracina, Gadinia conica, Nerita atramentosa, Paratrophon cheesemani, Barnea similis and Pholadidea* spp. (no soft rock here), sea star *Costinasterias calamaria* and crab *Ozius truncatus.*

ACKNOWLEDGEMENTS

Thanks to Rob Astley for providing copies of reference papers, hospitality at Piha and an exhilarating jet ski ride for M. Morley to (and from!) Mercer Bay! We also thank members of the Conchology Section of the Auckland War Memorial Museum for helping at Lion Rock and South Piha; Mathew Jones for providing some additional species found at Lion Rock in 1998; and Jessica Hayward and Hugh Grenfell for assistance with drafting of both figures.

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PIHA/ MERCER BAY SPECIES LIST: (a=abundant, c=common, f=frequent, o=occasional, r=rare,d=dead, x=Auckland Museum record, M&M=Morton & Miller)

	North Piha	South Piha & Lion Rock	Mercer Bay
Polyplacophora			
Acanthochitona zelandica	r	o	r
Chiton glaucus			r
Cryptoconchus porosus		r	o
Eudoxochiton nobilis		r	
Plaxiphora biramosa		r	
Plaxiphora caelata		o	o
Plaxiphora obtecta	f	o	f
Sypharochiton pelliserpentis	f	c	c
Gastropoda			
Alcithoe arabica		d	d
Archidoris wellingtonensis		M&M	
Austrofusus glans		d	
Buccinulum vittatum		o	
Cantharidella tesselata	c	c	c
Cellana ornata	r	o	r
Cellana radians	c	c	c
Dicathais orbita	o	a	c
Diloma bicanaliculata		o	o
Diloma nigerrima		o	
Eatoniella atervisceralis		r	
Eatoniella dilatata		r	
Eatoniella notata			o
Eatoniella olivacea			o
Janthina exigua		d	d
Lepsiella albomarginata	c	c	c
Melagraphia aethiops			f
Nodilittorina antipodum	c	a	a
Nodilittorina cincta		f	o
Notoacmea parviconoidea	c	c	c
Notoacmea pileopsis		c	o
Notoacmea scopulina		r	
Onchidella nigricans	f	o	o
Patelloida corticata	o	f	f
Radiacmea inconspicua		x	
Risellopsis varia		x	
Semicassis pyrum		d	d
Sigapatella novaezelandiae		d	
Siphonaria australis	r	ox	d
Tubbreva exigua			o
Turbo smaragdus	o	f	f
Zegalerus tenuis		d	
Bivalvia			
Austrovenus stutchburyi		d	
Bassina yatei		d	
Crassostrea gigas	o		
Divaricella huttoniana		d	
Dosinia anus		d	
Gaimardia finlayi		o	o
Hiatella arctica		r	o

	North Piha	South Piha & Lion Rock	Mercer Bay
(bivalves continued)			
Irus reflexus		r	o
Mactra murchisoni		d	
Paphies donacina		d	d
Paphies subtriangulata		x	
Pecten novaezelandiae		d	
Perna canaliculus	c	c	a
Peronaea gaimardi		d	d
Philobrya munita		o	o
Ruditapes largillierti		d	
Solemya parkinsoni		x	
Spisula aequilatera		d	d
Xenostrobus pulex	a	xc	a
Cephalopoda			
Octopus indet			r
Spirula spirula		d	d
Crustacea			
Alope spinifrons			o
Balanus decorus		o	o
Balanus trigonus			x
Calantica spinosa			r
Chamaesipho brunnea	a	xc	a
Chamaesipho columna	a	xa	a
Conchoderma virgatum			x whale
Cryptophialus sp.		M&M	
Epopella plicata	c	xc	c
Halicarcinus sp.			o
Hemigrapsus edwardsi		c	o
Lepas anatifera		x	x
Leptograpsus variegatus		xc	f
Petrolisthes elongatus		o	c
Pinnotheres novaezelandiae		o	
Plagusia chabrus		xo	f
Scutuloidea kuta		x	
Scutuloidea maculata		x	
Tetraclita purpurascens		f	o
Porifera (Sponges)			
Ancorina alata		r	o
Cliona celata		M&M	r
Halichrondria moorei	f	o	f
Tethya aurantium		o	r
Tethya ingalli	r		
Microciona coccinea	f	o	f
Ascidians			
Aplidium phorax		o	
Pyura rugosa			o

	North Piha	South Piha & Lion Rock	Mercer Bay
Coelenterata			
Actinothoe albocincta	f	M&M	
Amphisbetia bispinosa	c		c
Corynactis haddoni		M&M	o
Diadumene neozelanica		r	f
Isactinia olivacea	o	f	f
Isactinia tenebrosa		o	o
Isocradactis magna	o	o	o
Physalia physalis			d
Polychaete worms			
Pomatoceros caeruleus	o	f	c
Sabellaria kaiparaensis	o	o	
Echinoderms			
Allostichaster polyplax	o	f	
Evechinus chloroticus		r	o
Fellaster zelandiae		d	
Patiriella regularis		r	o
Stichaster australis	f	c	f
Algae & other polychaete worms -on request			

TWENTY YEARS AGO

It is the twentieth birthday of our "Bible" - A.W.B.Powell's New Zealand Mollusca.
Molluscan names change and new species are found, locality ranges expand and contract, but this book, now long out of print, is still in high demand as the best, indeed the only full treatment of the NZ Mollusca since Suters Manual of 1913. Look after your "Powell" : probably no one ever again will attempt such a monumental work! For name changes its a good idea to have Spencer & Willan's Index to the Fauna: 3. Mollusca as a companion volume.

(Jan.1979 Vol.10 part 1)
Gomphina maorum was generally considered to be found only at Cape Maria van Diemen although Powell that year also said "off Three Kings Islands, 92 metres", but didn't give any details. However N.W.G. reported that a few complete shells had been found at Bland Bay and Taupiri Bay, whilst a fresh whole specimen had been washed ashore at Long Beach, Russell, Bay of Islands, years before.

On the Three Kings, the *Placostylus* had increased from a few dozen to hundreds, due to the decision in 1946 to exterminate the goats. Much of the flora and fauna was saved just in time. The Island of St. Helena was not so lucky. The governor there suggested that the goats be removed as they were killing off the forest regrowth, but the East India Company said the goats were more valuable than the trees! The result was an island largely covered by "a dreary blanket" of New Zealand Flax and inhabited by *Helix adspersa* and *Oxychilus allarius*.

The fierce winter storms of Kaikoura were described by Bev Elliot with lists of finds and Rene Kindleysides had visited member Mrs Gay Mitchener on Great Barrier Island, who regaled her with stories of "the noted Great Barrier conchologist" Charlie Osborne, after whom *Maurea osbornei* was named.

Norman Douglas had received a collection from the Chathams and gave a preliminary list. He had also made cominella mats and used them in many different localities. Plans are included. His cartoon shows two people in a very small dingy hauling up a mat containing a very large and lively octopus!

Norman Gardner started his article on Sea Butterflies by saying that the Pteropoda are not well known by collectors, often not recognised as molluscs and poorly represented in collections. This is probably just as true today, and Norm's descriptions, especially the drawings are very useful. The animals are not easy to secure as they live a pelagic life in the plankton of the open sea, but the usually tiny fragile transparent shells can sometimes be found in bottom dredgings or beach strandings.

Schizoglossa novoseelandica barrierensis - Alive and well on the mainland?

by Peter Poortman

A few years ago I found a large number of fresh *Schizoglossa* shells in a small area of isolated bush near Karamu, west of Hamilton. Although the shells were in good condition, I had great difficulty determining whether this species was *Schizoglossa novoseelandica* or *Schizoglossa worthyae.*

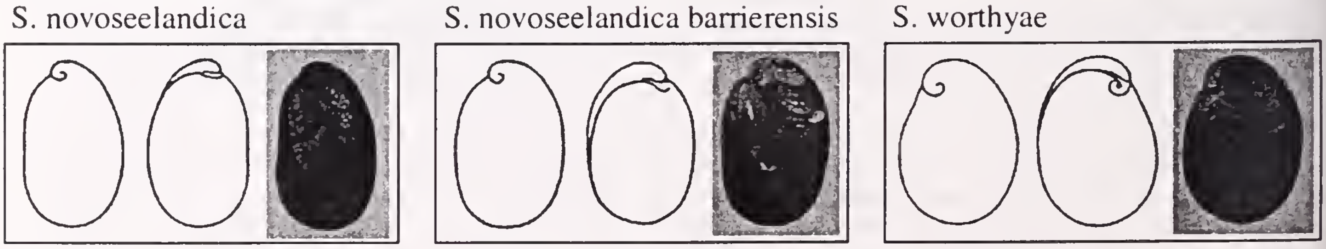
Recently I came across Powell's paper titled *The Paryphantidae of New Zealand'* (Rec. Auck. Inst. Mus. Vol. 3, No. 6, pp. 347-372, 21st December 1949). This paper gave a detailed description of the five *Schizoglossa* species, so I took the opportunity to have a more informed look at my strange lot. Again I could not decide between *S. novoseelandica* and *S. worthyae.* However, I was surprised to notice that they were in fact very similar to *Schizoglossa novoseelandica barrierensis.*

The location of the patch of bush is midway between the range of *S. worthyae* to the north, and *S. novoseelandica* to the south. Could it be that *S. novoseelandica barrierensis* is a hybrid of *S. novoseelandica* and *S. worthyae*?

Figure 1 - Specimens from Karamu.

Figure 2 - Pictures from Powell's paper:

S. novoseelandica | S. novoseelandica barrierensis | S. worthyae



A hybrid species of the Cape gooseberry (*Physalis peruviana*) and the Scotch thistle (*Cirsium vulgare*) have invaded the Tokatoka Point - Kararoa Stream coastal strip. Many plants of both species were encountered growing amongst Kikuyu grass (*Pennisetum clandestinum*) and bracken (*Pteridium aquilinum* var. *saxatilis*) as well as other european grasses during a traverse of this section. They are considered noxious by the author and it was suggested to DOC that a control strategy be implemented.The volcanic breccia sequence immediately north of Tokatoka Point (NZMS 260 1: 50 000 ; NO2/131535) is known as the basal member of the Tom Bowling Formation, assigned to the Kapowairua Member. The member is thought to be the result of an early Miocene (Otaian/Altonian) coastal erosional sequence. It outcrops immediately north of Tokatoka Point and contains Tangihua pillow lavas embodied within the unit. The deposit is 10-20 m thick and consists of a predominance of angular to sub-angular volcanic breccia consisting chiefly of primary and accessory ejecta 32 mm (cobble and boulder) or more in diameter lying sometimes in a fine tuff or coarse volcaniclastic matrix (which, in places, has weathered soft).

Abraded, badly weathered early Miocene fossils found within the sequence have been preserved as crystallised calcium carbonate remnants of the original marine animal.A fossil record number for the collection made from the above locality is recorded with the New Zealand Geological Society. Previous fossil records are those of Brook (NO2/f73; NO2/f74).Marine fossils are represented by: corals (ahermatypic and hermatypic), brachiopods, molluscs, worm tubes (polychaetes), bryozoans, crinoids (pelmatazoan and comatulid), sea urchin spines (cidarid echinoids), and sea star ossicles (asteroids).
Of the two crinoids recovered the comatulid centrodorsal appears to be a new genus and species; the pelmatozoan pluricolumnal appears to belong to *Austinocrinus* sp. indet., a genus previously known only from the Cretaceous of Europe. It is similar to a specimen lodged with the Geology Department, University of Auckland (collected by Dr Fred Brook) from the same general locality.

The paleoenvironment is tentatively interpreted as that of an inner-shelf (50 - 200 m) submarine reef formed by coastal erosion and down-slope transport of volcanic material. Depositional depth is attributable to subsidence due to depositional loading. The whole structure is now uplifted and partially exhumed. It is intended to formally describe the crinoids found. Since they appear not to have been reworked from older strata, it is also hoped to research the biogeographic implications of *Austinocrinus* existing c.50 Ma. after apparent extinction in the Northern Hemisphere. The North Cape fossil locality may be reworked from older strata, have been a refugia for the genus (enabling survival to this time), or a migratory route to younger localities elsewhere that have yet to be discovered (unlikely but possible).

ACKNOWLEDGEMENTS

The author wishes to thank the Department of Conservation staff Kaitaia Area Office (particularly Ian Hogarth and Kaye White), and Te Paki Acting Field Centre Supervisor (Simon Job), for patiently facilitating entry to the North Cape Scientific Reserve. Isabelle Aprea of Waitaki Landing provided authorisation to enter Muriwhenua Incorporation lands. Special thanks are due to "D. J." Neho who unselfishly gave time and effort to accompany the author to and from north Waikuku Beach.

3rd National Shell Show

27-30 October 2000, Auckland, New Zealand

The Conchology Section of the Auckland Museum is pleased to announce that the 3rd National Shell Show will be hosted in Auckland from 27th to 30th October 2000.

The show will cater for most classes of Mollusc, including fossils, and all levels of collector. Judges will comprise of several internationally known collectors and Malacologists. Dealers are very welcome, with trading tables being available at the show venue.

Entry forms, show rules, and other informational material will be available in early 2000. To register your interest and be included on the mailing list, please send the following slip to:

Peter Poortman,
23 Staincross Street,
Titirangi, Auckland,
New Zealand.

Visit our web site at: http://members.tripod.com/~nz_seashells

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POIRIERIA

Auckland Museum
Conchology Section

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"Poirieria" is the journal of a private club which is closely associated with the Auckland Museum. "Poirieria" is not available from the Auckland Museum Institute Library.

"Poirieria" welcomes contributions on suitable topics, typed, if possible, using Times New Roman, 12pt, with titles 16pt bold and author 14pt bold. Your co-operation will help keep the appearance of our journal consistent. A printed copy on A4 paper should be sent by mail to:

Jenny and Tony Enderby, PO Box 139, Leigh, 1240, New Zealand.

Subscription to "Poirieria" is by membership of the Auckland Museum Conchology Section (enquire of the secretary) or overseas, by payment of NZ$40 limited membership or NZ$25 each issue for economy airmail.

Some back numbers of "Poirieria" are available.

Please send all changes of address, queries on distribution of "Poirieria" and reciprocal material to:

Nancy Smith, 4 Kallista Place, Browns Bay, Auckland 1310, New Zealand.

All other correspondence should go to:

The Secretary, Glen Carter, 1 Guardwell Tce, Mt Albert, Auckland, New Zealand

James Frederick (Jim) Goulstone 14. 6. 32- 4.10. 99

This issue of "Poirieria is published by the Conchology Section of the Auckland Museum in memory of Jim Goulstone, who was a keen member for 40 years. Jim following in his grandparents footsteps , started with an interest in marine molluscs, but soon diverted to a lasting interest in New Zealand's small landsnails. He tramped all over New Zealsnd collecting specimens and built up a comprehensive collection which he donated and accessioned to the Auckland Museum. This vast work is outlined in the Tribute by Bruce Hayward who was at that time curator of molluscs at the museum.
Jim generously shared his knowledge with club members by giving talks, leading field trips and contributing to the club magazine. His wry sense of humour delighted us and his continuing self–education amazed us. Snails that we could only see under the microsope, Jim learned to dissect and gave us graphic descriptions of their more intimate parts. He is missed by us all.
Jim is survived by his wife Gladys who is a valued member and friend of the club, and his four children and seven grandchildren.

Nancy Smith.

Tribute to Jim Goulstone at his funeral, given by Bruce Hayward

I have probably known Jim for a shorter period of time than many of you here. I first remember Jim coming along to the Museum just after I had been appointed as Curator of Marine Invertebrates in 1991. He came forward to offer his services to help us with a major job we had in hand, to rehouse and recurate the entire shell collection of the Museum. And Jim came and he said "I am interested in landsnails, New Zealand's smaller landsnails particularly, and I'd like to help", and he was still helping right up to the time of his death. In those eight years, my conservative estimate is that Jim has put in about 10 000 hours of his time towards improving the Museum collections. People in the Museum may wonder how could it be so many. It is because most of Jim's contribution was made at home. He worked at home on his collection and on the collection of the Museum, and now his entire landsnail collection is fully curated, fully documented on the computer database and fully housed as part of the Museum collection. He also went right through the entire existing collections, reidentified the lot, recurated it, entered it in the computerised database, accessioned it and put it in place in the Museum collections during those years.
[Additional note: At the time of Jim's passing, the Auckland War Memorial Museum mollusc collection contained 20 000 identified species lots of New Zealand landsnails. 6 500 of these had actually been collected by Jim, 15 000 of these identified by Jim, and about 10 000 entered into the computer database by Jim. In addition there are bulk collections of snails housed by locality and these contain an estimated additional 10 000 species records, all collected and identified by Jim and also entered in the computerised species lists by him].
As a result the Auckland Museum collection is currently the best documented collection of New Zealand landsnails anywhere in the world, and this is all through Jim's work.
I believe Jim first became interested in landsnails in the 1970s. In the 1980s, as a member of the Auckland Museum Conchology Section, this interest flourished. He was helped along the way and encouraged by a number of the members of the Conchology Section, including the Gardeners. In those early days, as we have heard, he went off and did extensive collecting right around the country and started documenting the faunas he found.

In the 1990s, when I first got to know Jim and he began his closer association with the Museum, his skills began to broaden and he taught himself the tasks of scientific description and scientific research. He taught himself word processing and indeed bought himself several computers so he could put together his own papers. He taught himself, probably better than anyone else in the Marine Departments, how to work and understand the Museum's relational database. He ran a copy at home, so he could do all the entering at home and then brought a copy of his new entries in once a week, so he could add it into the Museum's master database. We all used to marvel at the Jim's self-taught skills of dissection of the soft parts of his minute landsnails using sharpened needles under his microscope.

As we've heard Jim was a great collector of small landsnails and certainly has added a great deal in all the collecting he has done around the country. He was often in fact one step ahead of all the other collectors. I remember in the 1990s, when others were still head down looking for snails in the litter on the forest floor, Jim was up the trees breaking new ground finding arboreal snails that no-one had thought of looking for before.

I thought I'd read you a little story too, only this is a story Jim wrote. A story he wrote about one of his many unusual collecting trips and it was published in the Conchology Section Newsletter, Porieria, in 1996: "The week of last year's Ellerslie Flower Show also saw the grounds of Auckland's Government House open for two days. Gladys and I gave the former a miss, but set out on a wet Friday with our umbrellas to see what grandeur the latter had to offer. An information brochure at the guardhouse with a useful map plus lots of arrows on

stakes, plus lots of volunteer guides with arm bands, none-the-less failed to inform us of the greatest treasure the garden had to offer. A pristine rock outcrop with some original native growth, mostly karaka and mahoe. Of course you guessed, the rocks were full of native snails and we hadn't taken a bag or even a tube, so while Glad strode ahead pretending she had nothing to do with me, I guiltily collapsed my umbrella and filled it with leaf litter. How foolish I felt inspecting the rest of the gardens in the rain using a bulging umbrella as a walking stick." Jim then proceeded to list the species of snails he extracted at home, a total of 24 species he found in the leaf litter he collected in the Government House gardens. That was typical Jim.

And so Jim, you have made a wonderful contribution both to the Museum and to our understanding of New Zealand's native snails. You've described over a dozen new species and had one named after you. You've also described a new genus.

Jim, the Museum thanks you for your major contribution to the collection and New Zealand natural science salutes you as a scientific researcher, and for the contribution and legacy you leave in the knowledge you have added about New Zealand's native snails.

A SURPRISE AT GOVERNMENT HOUSE, AUCKLAND

Jim Goulstone

The week of last year's Ellerslie flower show also saw the grounds of Government House open for two days. Gladys & I gave the former a miss but set out on a wet Friday with our umbrellas to see what grandeur the latter had to offer. An information brochure at the guardhouse with a useful map, plus lots of arrows on stakes, plus lots of volunteer guide ladies with E.R. armbands nonetheless failed to inform us of the greatest treasure the garden had to offer, a pristine rock outcrop with some original native growth mostly karaka and mahoe.

Of course you've guessed the rocks were full of native snails and we hadn't taken a bag or even a tube -- so while Glad strode ahead pretending she had nothing to do with me I guiltily collapsed the umbrella and filled it with leaf litter. How foolish I felt inspecting the rest of the gardens in the rain using a bulging umbrella only as a walking stick.

Here is a list of snails I extracted at home from the umbrella. Charopa coma (Gray), Charopa parva (Suter), Cochlicopa lubrica (Müller), Delos coresia (Gray), Flammulina perdita (Hutton), Geminoropa cf. cookiana (Dell), Lauria cylindracea (da Costa), Liarea egea (Gray), Mocella eta (Pfeiffer), Oxychilus cellarius (Müller), Paralaoma caputspinulae (Reeve), Paralaoma lateumbilicata (Suter), Phenacharopa pseudanguicula (Iredale), Phenacohelix giveni Cumber, Phenacohelix pilula (Reeve), Phenacohelix ponsonbyi (Suter), Phrixgnathus erigone (Gray), Phrixgnathus cf. ariel (Hutton), Phrixgnathus conella (Pfeiffer), Phrixgnathus moellendorffi (Suter), Punctid n. sp. 29, Tornatellides subperforata (Suter), Tornatellinops novoseelandica (Pfeiffer), Vitrea crystallina (Müller).

A strange omission from this substantial list is Helix aspersa Müller so I can only compliment the gardeners who have evidently not spared the "Blitzem".

P.S. One or two of these species came to light the next day after I sent along another collector who I wont incriminate!

Memories

by Norm Gardner

Well back in the year 1978, the Conchology Section decided to hold a Shell Show- the first time in this country.

To help things along it was planned to make a supply of glass topped trays for exhibits and who should be a big help but Jim, who arrived with a load of glass panes not needed immediately for his tomato glass houses, contributing to the great success of the Show.

1975 was a memorable year for Jim and me. The distribution of the land snail fauna about Dusky Sound in Fiordland, had not been checked over and we were invited to visit the area by Park Board rangers. This involved a week in the Sounds on their boat "Renown".

As usual on these trips Murphy's Law applied! We were told to arrive at the Ranger's house in Te Anau in the afternoon, but airline flights were rearranged, so we had to travel some distance by bus, getting to our destination late at night. We were dumped on the roadside where all the houses nearby were in darkness. We selected a likely looking house but we were undecided whether to wake the residents or to bed down on the roadside, however a dog nearby did not like us discussing the situation and started barking. Lights came on and it luckily proved to be the right house. We were made welcome by Ranger A. Cragg and his wife who thought perhaps we had "chickened out"!

There is a considerable distance of open sea between Doubtful and Dusky Sounds, and we struck some very rough seas which made things rather uncomfortable- such rolling and flying spray!

Each day we were landed at likely spots and on Five Fingers Peninsula, Resolution Island we found *Paryphanta fiordlandica* to be quite numerous- over 200 snails were seen.

Thirty species of small land snails were obtained and "written up" in a report for the Park Board.

After such an eventful trip to Dusky Sound, Jim decided that a further expedition in the Fiordland area was a "must". He successfully arranged with the Park Board to do a survey of the land snails in the isolated area around the southern Lake Hauroko.

We arrived at the southern shores of Hauroko- this time without problems, and boarded a small boat with out-board motor to cross the lake to the other side for a day's snailing in rather wet and messy situations.

Next day we were taken a considerable distance north to the top of the lake, and told we would be picked up in a couple of days. Snailing was a little better here, but the sand flies weren't!

After our two days we waited for the appearance of the Park Board's little boat, but it seemed as if we had been forgotten!

Later in the afternoon a helicopter touched down on the foreshore and we were taken back after a scenic flight. Staff were using the helicopter on some job anyway. To Jim, this was the ultimate in collecting land snails- a helicopter was a must! But, for all his collecting expeditions since, I do not think he was able to make use of one.

\- - - - - - - - -

Thank you Jim for being so generous with your time in discussing the vagaries of some snail species and then carrying on to do so many illustrations.

We travelled together to Te paki and as far south as the Auckland Islands. Sorry about the vagrant Hookers Sealion which chased you mercilessly at Ranui Cove. We corresponded for twenty years and must have been a boon to the New Zealand postal service, as parcels of snails went back and forth. Sometimes recycled packets began to look fragile, but Kodak slide containers with matchboxes full of labelled gelatine capsules always got through.

Your contributions to the Auckland Institute and Museum were magnificent, so many hours, so much dedication. As well you found time to dissect and check Genus and species whenever there were doubts. One fact of particular interest was the dissection of an animal collected thirty years earlier by A.W.B.Powell. To keep this in perspective when one has a collecting permit, remember to collect and preserve live adults of minute landsnails for the Museum collection.

Vale, Pauline.

By Bruce Hazelwood

Jim was one of my best friends, snails being the common denominator, telephone conversations were regular. These discussions added considerably to my knowledge of terrestrial molluscs. If I could not remember something, where to find information, or what paper, Jim would know or vice versa.

I accompanied Jim and Gladys on many trips, some in recent years to obtain samples for Jim's *Climocella* papers.

One trip stands out, this was to a midden site at the Mangere Sewage Ponds. This is a scoria heap covered by Maori midden debris. I rescued four specimens of *Alcithoe arabica* (Knobbed form) all with the protoconch and early whorls broken off (easier to get at when being eaten?). Few marine species of molluscs were present, the commonest being *Austrovenus stutchburyi, Pecten novaezelandiae, Cyclomactra ovata, Macomona liliana, Alcithoe arabica, Cominella adspersa, C. glandiformis, Melagraphia aethiops, Diloma subrostrata* and *Ostrea lutaria.*

The main reason for going there was the sub-recent land snails which accumulate in the depressions on top, in, around and under scoria boulders. I was not very successful at this type of collecting, however Jim was head down bum up - like a rat down a drain pipe! A pile of midden dirt soon piled up behind him. This is where I got my best litter samples. The material collected at this site is of interest, being one of two typically "fossil" localities around Auckland. The other being from excavation sites on Rangitoto Island. The snails that lived in this scoria heap approximately 150-300 years ago, have their own particular shape and form and are probably related to the Waitakere Ranges fauna.

Jim leaves an enormous legacy, the specimens, drawings and reports are in many cases the only record of the land snail fauna from many parts of New Zealand. They are essential reference data for future research. A case in point being a survey by myself in the Hunua-Kakamatua area of the Waitakeres. This is fine tuning on a sector with a list of species and locality data contained within Jim's report.

In the last six months Jim was working on the *Laoma "poecilosticta"* complex. It was recognised that many forms are present in the Auckland area (Climo unpublished). Where possible Jim added anatomical information to the present knowledge of these species. Unpublished anatomy drawings are completed.

The three described species of the *L. "poecilosticta"* group are *L. poecilosticta, L. conicula*, anatomy unknown, found from North of Waiwera to Hokianga and *L. transitans,* anatomy unknown, found at Whangarei.

Six informal names in this group were recognised by Jim as separate species, they still need formal recognition. These are: *L. "adnatus"* found in Waikumete Cemetery, Auckland; *L. "manuka"* found from Betty Headford's property in Makarau Road,

Kaukapakapa, north-west of Auckland, to the Warkworth area; *L. "karekare"* from Karekare to Whatipu, Waitakere Ranges, Auckland; *L. "leo"* found on Lion Rock and adjacent mainland area at Piha, Waitakere Ranges, west Auckland; *L. "domus"* from East Cape to the Bay of Plenty and *L. "lampra"* (Punctid n.sp. 55) from Auckland and Northland areas.

Jim recognised as different species over 100 other undescribed land snail taxa. Approximately 40 of these from the Auckland area. Specimens of all these undescribed species and in some cases the preserved animal are lodged in the collections of the Auckland War Memorial Museum.

It is hoped that some day in the not too distant future, someone will use Jim's work as a basis to formally describe these species.

Jim will be sadly missed, his legacy lives on!

— — — — — — — — —

When planning for the 1984 shell show to be held at the Akoranga training centre at Northcote, some members expressed concern for the security of their shells in the hall during the nights as no particular security systems or services were part of the hire. It was decided that some members might like to offer to sleep on the premises and hopefully wake should there be any disturbances. So on the allocated night Jim Goulstone along with his son Richard and I (Doug Snook) spent some time sharing together. Our cars had been strategically parked and hall lights on to show to the maximum, our presence. Late into the night our camp stretchers were erected and placed about the hall so as to avoid any snoring that might occur. In a building not planned for sleeping in, there were many strange noises throughout the complex that kept us from sleeping soundly , but aided our usefulness in the task for which we had volunteered. I granted it a privilege to have shared this experience with a well-thought-of and respected member of our club. This event contributed to a friendship that grew over the years as we discovered we shared similar beliefs in our journey through life, the memories of which I will always value.

Doug Snook

Unfortunately my aquaintance with Jim and Gladys has not been very long- much to my regret! I had chatted with them at Shell Club meetings and on field trips, then last April Jim and Gladys came to stay the night with me between field trips. That's when I had the pleasure of really getting to know them. They arrived slightly damp from a Botany Society trip in the bush behind Pebble Brook Rd, Jim despite the showery weather, irrepressible as ever, bubbling over some of his finds. He had not done much collecting in this specific area. When I mentioned my 5-10 acres of bush that joined up with my neighbours 15 acres and that we'd had it fenced off from animals for many years, his eyes lit up. Sure enough next morning he was off for an explore and rumage in the leaf litter. He returned with a gleam in his eye pleased with the number and variety of species he had found.

I wish I had had longer to absorb some tiny bit of the wealth of knowledge Jim had and so freely shared. His enthusiasm though has set alight a quest for knowledge for me and I am sure for others.

Within a couple of weeks I received the following letter with attached tiny file of specimens.

Jim is certainly missed.

Betty Headford
April 2000

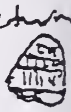
Betty

Your piece of bush is very healthy as regards snails!! It hasn't been ~~burnt~~ or ~~too~~ badly damaged by animals. It contains:-

Sericoconcha fulgurata (Suter)
Paryphanta poecilosticta (Pfeiffer)
Liarea turriculata (L Pfeiffer)
Cytora pallida (Hutton)
Delos coresia (Gray)
Rhytida greenwoodi (Gray)
Mocella eta (Pfeiffer)
Allodiscus urquharti (Suter)
Kaupotaka adnatus Climo ms.
Therasiella neozelanica Cumber
" celinde (Gray)
Climocella cavelliaformis Goulstone

both of these are carnivores. The Rhytidas I found were juveniles - though alive) There must be some big ones around (bigger than a helix garden snail).

Museum Collection
L 22194 for dead
L 22195 - live
Q10 454148 60m?

Most of these species were found live and although there is not as big a number as there might be - to me it seems very good for that tanekaha - totara mix which ~~[illegible]~~ I collected. Also the species are not marginal species which predominate in poor sites. I have returned a Liarea which you will easily be able to see - a poecilosticta  Sh is common but you would really have to look for - and a Delos  (the flat one) likewise.

Regards Jim

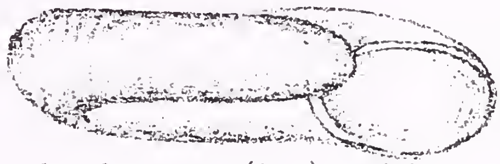
93 Hall Av.
Mangere
1/6/91

M. Morley
25 The Boulevarde,
Pakuranga,

Dear Margaret,

Thanks for all the leaf litter which I have now sorted. I have been a bit remiss with some of your material in the past so I am making up for it with this lot. My son and daughter in law John and Kirsten are heading down there on Sunday and will walk in 3 hours to a hut and then do a round trip, coming out on Friday. They planned it from your little book which I here return.

Strangely, it is not easy finding snails in a big primeval forest, it is much easier in cutover and scrubby growth. In the virgin forests where the light is low and the ground is covered with big voracious roots, where moss and lichen cover everything, loose composting litter of a type that snails like is almost non existent. Make no mistake, the snails are there but they are well spread and it is difficult to find any concentration. Your litter was a bit like that, except in two cases where it was extra wet and had heaps of **Planorbis** in one and **Omphalorissa** in the other. I've never collected **Planorbis** in litter before and it was rather a thrill. Was it under water or high and dry? It also had **Lymnea** in that sample.



Planorbis corrina(Gray). Arahaki Lagoon, Whirinaki, 21/4/91
2.4 x 0.7 mm.

Here is a list of what I found.—

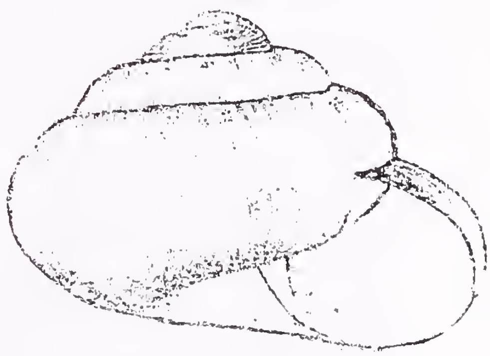
1. Arahaki Lagoon Track, Tawa & Rimu, 21/4/91.
Punctid sp. cf 43 1 A few juveniles of **Punctid n.sp. 1**

2. Arahaki Lagoon, Kahikatea, 21/4/91.
Planorbis corrina 50+ **Lymnea tomentosa** 3.

3. Whirinaki Track, top of waterfall under Tawa 22/4/91.
Huonodon hectori 1. 1 very juvenile something.

4. Arahaki Track, Rimu and Tawa 21/4/91.
Omphalorissa purchasi 33. **Phrixgnathus mariae** 2.
Therasiella neozelanica 2 **Kokopapa monospathulata** 1.
Punctid n.sp. 29. 3. **Paralaoma sericata** 3.
Cavellia buccinella 1.

5. Waterfall Track under large Kahikatea 20/4/91
Therasiella serrata 7. **Phrixgnathus ariel** 2.
Climoropa 6 2. **Huonodon pseudoleioda** 1.
Paralaoma lateumbilicata 3. **Huonodon hectori** 4.
Cavellia buccinella 2. **Charopa pilsbryi** 1.
Therasiella cf neozelanica 1. A rather worn **Punctid n.sp. 7 ?**
Cytora chiltoni 1. **Serratopunctum serratocostatus** 1.



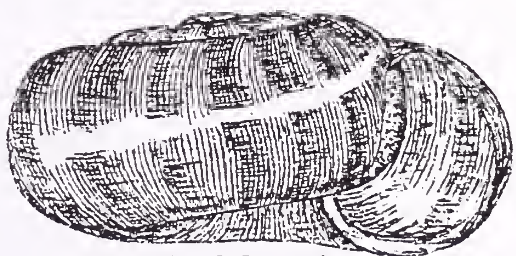
Punctid sp. cf 43 Arahaki Lagoon
1.4 x 1.2 mm. 21/4/91

6. Waterfall Track, under a large Rimu, 20/4/91.
Flammulina perdita 2. **Laoma mariae** 1.
Therasiella serrata 2. **Phrixgnathus ariel** 1.
Climoropa 6 1. **Therasiella cf neozelanica** 2. **Obanella rimutaka** 1. **Cavellia anguicula** 2.
Cavellia reeftonensis 1. **Huonodon pseudoleioda** 1. **Huonodon hectori** 1. **Cytora chiltoni** 1.
+ one juvenile unknown Punctid.

The **serrata** specimens were in very nice condition and this is the furtherest south I have ever collected them. **Punctid sp. cf 43** was also in pristine condition and although it looked a bit different from my Auckland ones it probably is the same. These little plain **Punctids** are the devil to sort and separate. **Climoropa** is my make-up name for what we were calling 'Mocella'. Since Frank pinched the name **Mocella** for the **eta, rakiura** group and failed to supply a replacement for the bereft genus I felt it appropriate to use his name in the meantime. **Climoropa** , I believe, has quite close ties with **Geminoropa** which makes it more fitting.

I'd better not ramble on, but hope you find something of interest in all this. Its amazing what a few bags of uninteresting looking dirt can reveal to the enthusiast is'nt it ?

All the best,
Jim Goulstone.



Climoropa 6 2.5 x 1.4 mm.
Waiau River, 5/81

An Inordinate Fondness for Land Snails: A Tribute to Jim Goulstone

by Stephen Thorpe

To be a professional is one thing, but to be what I shall call an "authentic" is even better. Jim was an authentic. Land snails for him were not a mere job, they were a passion. This makes his death not merely unfortunate, but rather a full blown tragedy for the study of land Mollusca in New Zealand. There may never be another Jim Goulstone.

I first met Jim in about 1982, when I was twelve years old. At that time I had a small passion for land snails, and a big passion for beetles. Jim encouraged me in both areas. We used to see each other at the Auckland Museum Shell Club Meetings until I left in about 1985. Nowadays my big passion for beetles has become even bigger, leaving little or no time for land snails. I remember Jim bringing back a couple of beetles for me from the Auckland Islands.

I didn't see Jim again until 1998, when I started spending a lot of time in Auckland Museum's Entomology Department. I took him down into the Domain to see a large aggregation of what he identified to be *Charopa coma* under sections of cut oak tree lying in long grass on open ground. He was intrigued by this. He put several specimens into the Museum Collection. We talked about snails and beetles. He was quite proud of having once collected a pair of undescribed giant stag beetles from Mount Moehau. I believe that one of his specimens is to be the holotype. At this point I think it appropriate to at least pay lip service to the fact that it doesn't really make too much sense for a Marine Department to handle land snails. It would be better to have an integrated terrestrial invertebrate department. This is because collectors of land snails inevitably find many insects in their travels, and vice versa. Jim did his best to utilize the insects that he was finding, but the time constraints on one man meant that much important new insect information must have gone to waste. The same is of course true for snail information in the Entomology Department. Museums ought, I believe, to be places of active research, and not just "rest homes" for old collections, many of which don't really have much scientific, aesthetic, cultural, or monetary value anyway.

Anyway, Jim once told me of a trip in which he almost got lost. I am told that the impression of most people is that Jim never got lost. He had climbed to the top of Mount Manuoha in search of *Powelliphanta marchanti*. After several unsuccessful hours of crawling around on his hands and knees, he finally gave up. The problem was that he hadn't really been taking too much notice of where he had been going. Everywhere suddenly looked the same and night was just around the corner. He was not really prepared to spend the night up there, so it was lucky that he did in fact manage to get out of there in time. This seems an appropriate point to reiterate Jim's passion and committment to his cause.

Some Landsnails on Tiritiri Matangi --- September 1989

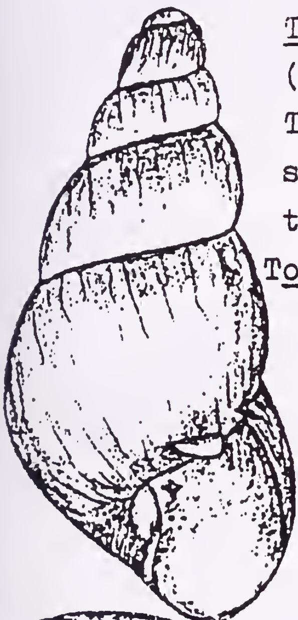
J.F.Goulstone.

; South Auckland Forest and Bird Society visited the Island on a .ous spring day and after the ritual tree planting I spent a couple ours looking for snails. Our native snails are strictly bush dwellers the history of Tiritiri was such that I didn't hold out much hope inding any survivors. Which was very sad for with the present plan the island an ideal environment for snails is in the making.

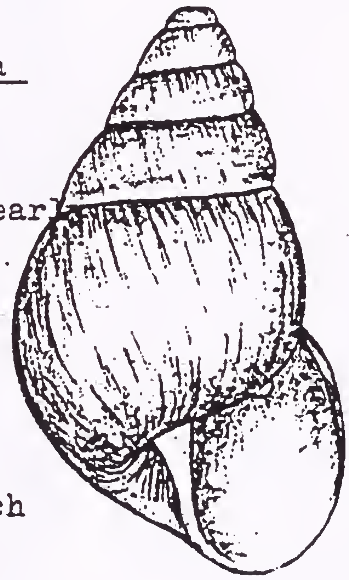
concentrated my limited time on two areas where snails might be able ang on, the cliffs below Tiritiri Matangi Pa and some rocks behind s Beach. This resulted in the finding of ten native species and one oduced. By way of comparison the Forest and Bird Reserve at Onetangi eke Island has around forty species.

st of our native snails, perhaps five hundred species, are very small, he one to five millimetre range. Because the primeval New Zealand was so rich in birds, particularly ground dwellers scratching around he litter, life for a tasty snail must have been fairly perilous. better way to escape the predators than to keep getting smaller.

ese illustrations come from a report I am preparing on South Auckland ls -----

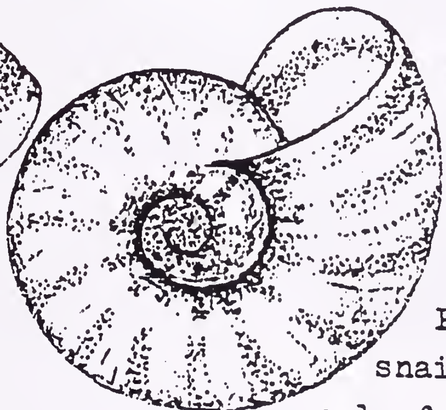


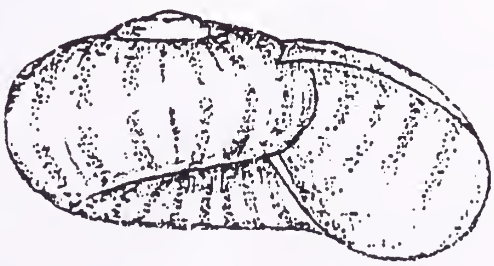
Tornatellinops novoseelandica (Pfeiffer). 1.2 x 2.8 mm. This is one native that can survive without bush, very nearly the only one.



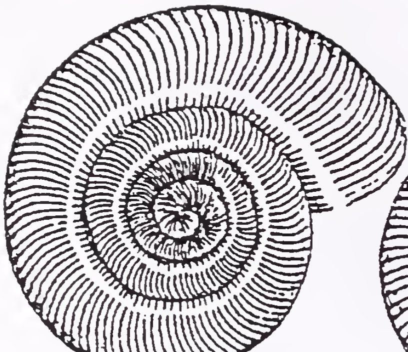
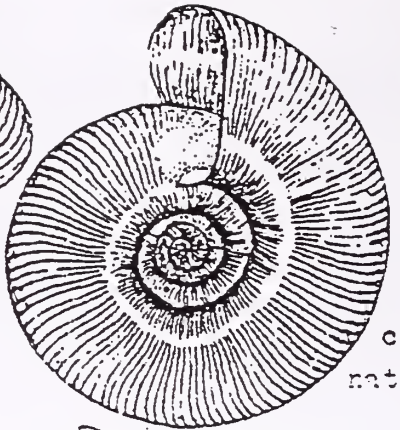
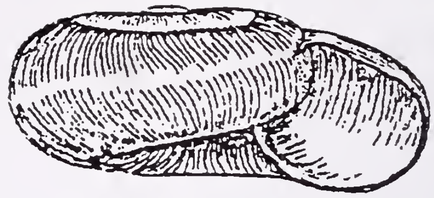
Tornatellides subperforata (Suter). 3.7 x 2 mm. Around Auckland this is a purely coastal species. It was in the rocks behind Hobbs beach in quite large numbers.

Delos coresia (Gray). 3 x 1.5 mm.

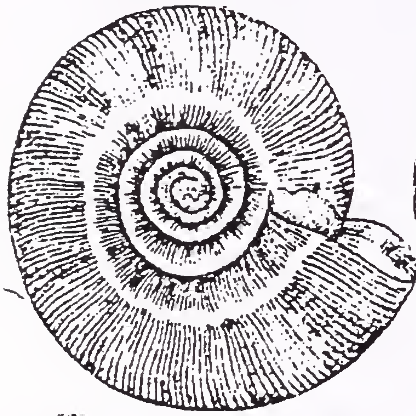
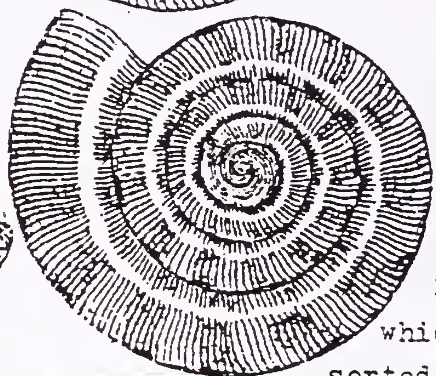
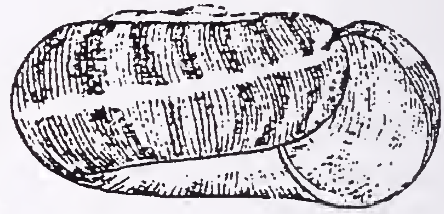




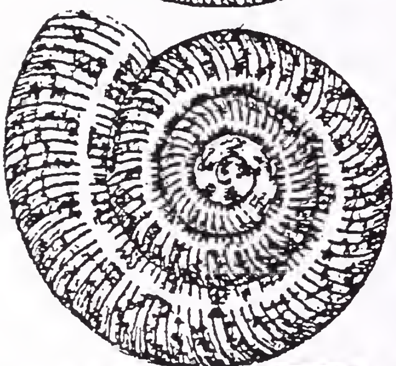
A relative of the large Paryphantas, this little snail is also a carnivore. I only found one of these.

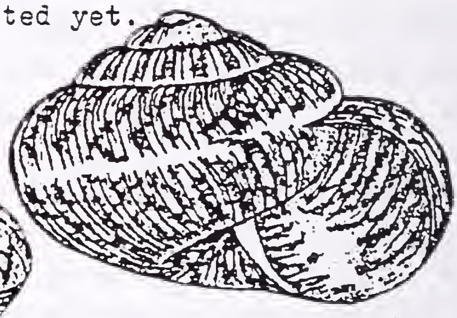




Mocella eta (Pfeiffer) 2.5 x 1.2 mm. This is the most common and widespread of the native sails around Auckland.

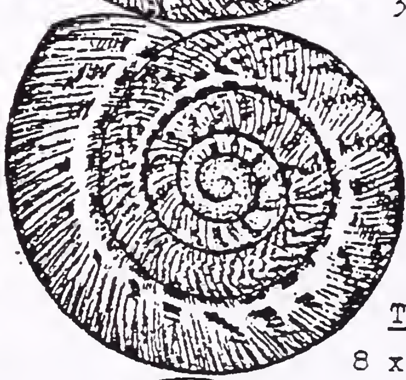
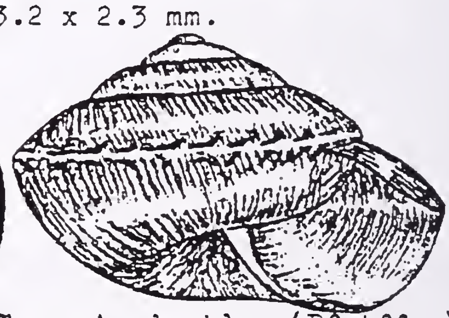




'Mocella'sp. 3. 2.5 x 1.3 mm. A group which has not been properly sorted yet.

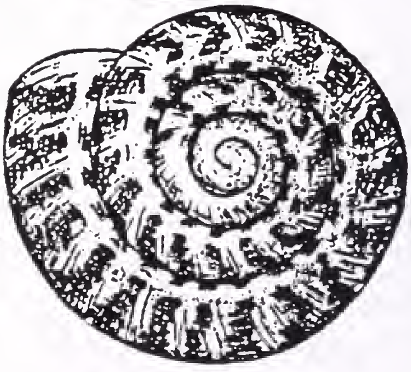
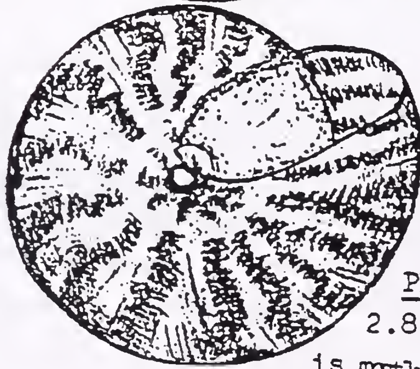
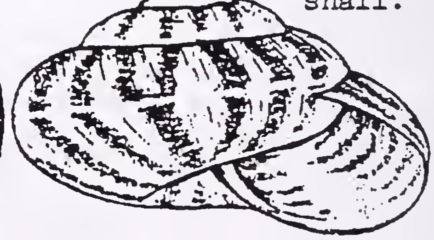




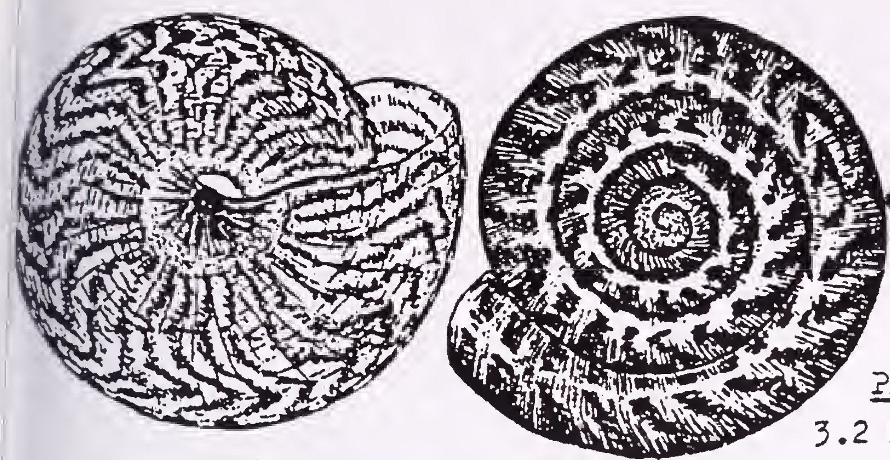
Phenacohelix pilula (Reeve). 3.2 x 2.3 mm.

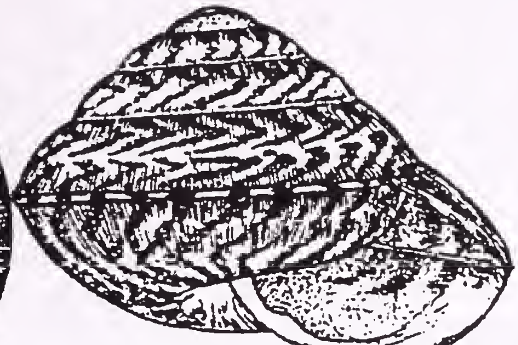




Therasia decidua (Pfeiffer) 8 x 5 mm. A relatively large snail.

Phrixgnathus n.sp. cf ariel 2.8 x 1.7 mm Another one which is mostly coastal and likes flax.

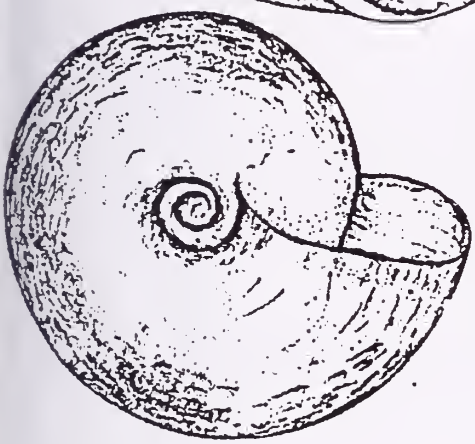


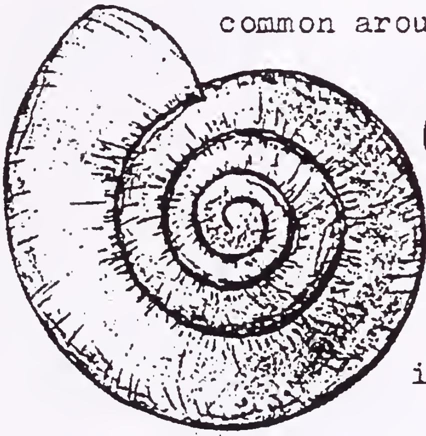


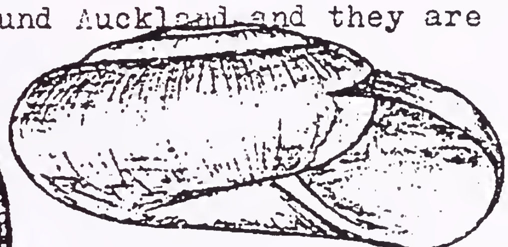
Phrixgnathus conella (Pfeiffer
3.2 x 2.2 mm.

Laoma poecilosticta (Pfeiffer). 3 x 2.8 mm. I found this snail to be very plentiful around the pa and although it is a common snail around Auckland I feel it needs good bush and is not particularly tolerant of salt spray.

Oxychilus draparnaldi (Beck). 7 x 3.5 mm. An introduced species often present in great numbers. There are three Oxychilus sps. common around Auckland and they are not easy to separate on shell features. Draparnaldi is the largest.







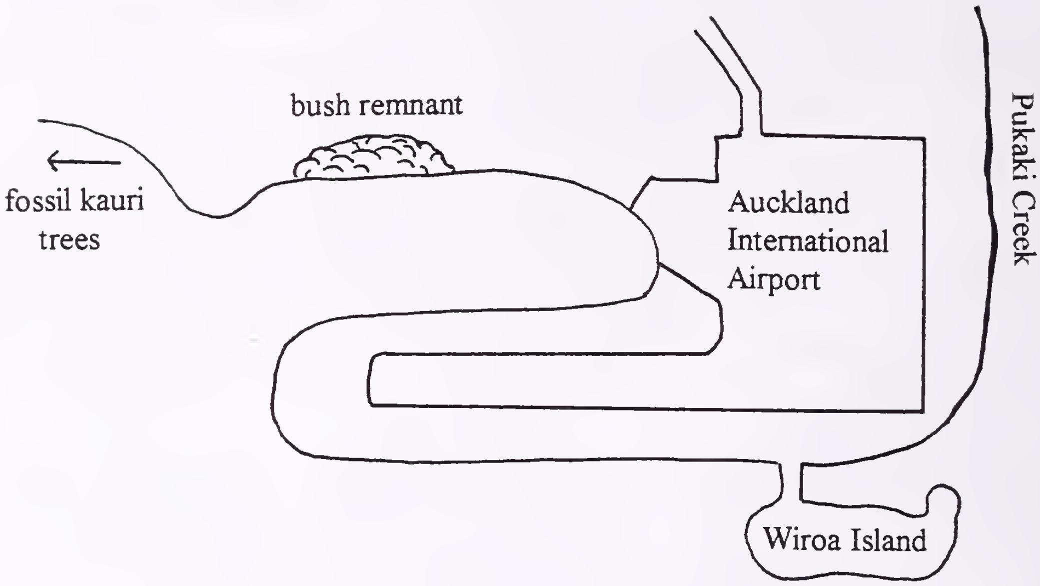
I have no doubt there are more species on the island but maybe not many more. In the restricted space of an island like Tiri it should be possible to completely evaluate the species present and then monitor them on a regular basis. With such a deep litter emerging under some of the bush it will be interesting to see what land mollusca eventually inhabits it.

Mangere.
Auckland.

NOT SO FAST

by J.F. Goulstone

The jets roar in from far and near
A snail slides steadily along a rotting log
A thousand miles and half a yard
In a billion years.



I became quite poetic one Sunday evening recently on finding a remnant of bush harbouring a little colony of native snails, not 200 metres from the Airport runway and also about the same distance from large kauri trunks fossilised in the Manukau mud - a reminder of past forest grandeur.

The snails present- of course *Phenacohelix ponsonbyi* and *Phrixnathus celia,* both living on flax at the water's edge with *Thalassohelix zelandiae* up in the leaf mould under the trees; all these species in large numbers.

Also in the leaf mould, though not so plentiful, were *Flammulina perdita, Laoma poecilosticta, Tomatellinops novoseelandica, Charopa bianca, Delos coresia.* We've circled our globe and stood off and looked at it from afar. I wonder if these denizens of the forest realize how small and threatened is their domain?

Published in Poirieria 8(2) December 1975.

Illustrations opposite:- (*clockwise from top left*)
Collecting in the rain at Titirangi.
Surprised at the microscope.
Coming back from the wilderness, Chatham Is.
The club trip to Chatham Is.
The club trip to Great Barrier Is.

LANDSNAILS OF THE AUCKLAND ISLANDS.

Pauline C. MAYHILL 177 Maple Close, Welcome Bay, Tauranga
James F. GOULSTONE 89 Hall Ave., Mangere.

SUMMARY. Five new species are listed, together with a new record for the island group, plus three new records for Disappointment Island. Some unknown environmental factor has encouraged the development of very fine radial and interstitial sculpture. Ten of seventeen species found have the characteristic of fine ribbing. It is possible that this is due to a lack of available calcium on the islands. The resulting thin shells will gain extra mechanical stability from this feature.
A distribution table is also included.

INTRODUCTION. A survey of the Auckland Island snail fauna was undertaken from December 4th to December 9th 1983. More time would have enabled reconnaissance at higher altitudes as access was difficult and time consuming. The Hooker Hills could perhaps be more easily accessible than some other higher altitude sites. Coastal vegetation was easier to penetrate as there were often animal tracks. Sight collecting was carried out and small amounts of litter were taken. Hookers sealions were not fully co-operative and caused some hasty retreats at Erebus Cove and at Ranui Cove.

GEOLOGY. The Auckland Islands are volcanic in origin, made up of two basaltic volcanoes erupting in the Pleiocene age. Limited fossil marine deposits indicate that the sea temperatures were formerly much warmer than at present. Limestone and conglomerate sandstone have been exposed at sea level, but are generally covered by large basaltic flows. The inlets and valleys of the East coast show typical glacial features with spectacular cirques. At present peat covers this rock base, though ancient sandhills on Enderby Island are a marked contrast to the rocky coastline normally encountered in the Island group.

OBSERVATION SITES.

1. Erebus Cove. Raining as collection started. A few flax bushes on the shoreline. Meterosideros umbellata (Rata), Myrsine divaricata, Hebe elliptica, Dracophyllum longifolium, Coprosma foetidissima were the main cover. Collecting carried out from the shore to 300m. At this altitude tussock and stunted M.divaricata with D.longifolium predominated.
A patch of Olearia lyallii was searched to no avail, very good litter, no snails seen. Base of a rock wall was searched, this was very wet, and snails were found on twigs and under bark.

2. Enderby Island. A circuit of the Island was carried out but the bush was eaten out by animals. Small steep gullies with tight Myrsine and Cassinia vauvilliersii cover produced a few species. The Rata forest remaining in the South West though badly eroded by animals still contained three species in the top soil. Some suitable bark habitat.

3. Tandy Inlet. Rata forest difficult to traverse. Many steep sided gullies, and some patches of tussock. very few snails except for a small headland of mixed rata forest.

4. Hanfield Inlet. a. Bush at base of Basalt cliffs, much moss, some Dracophyllum litter. Rotting Dracophyllum logs.
b. Tree ferns, (Cyathea smithii) with Hebe elliptica, C.foetidissima, with slime litter, Stilbocarpa polaris, Anisotome latifolia.

5. Waterfall Inlet. High Rata forest with good litter.

6. Epigwaitt. Sea level, Rata forest with Urtica australis, Acaena two species, plenty of twigs.

7. Adams Island. a. Rata forest above shore with much Polystichum vestitum. Soil friable.
b. Fairchild's meadow, tussock with C.cuneata, Stilbocarpa polaris, Anisotome two species, Pleurophyllum two species, soil very compacted.

8. Disappointment Island. Heavy rain overnight, and raining all the time ashore, soil very compacted. Hebe elliptica the only woody shrub, Pleurophyllum two species, S.polaris, Anisotome latifolia and much tussock. Present in areas deserted by Diomedea cauta cauta were Hebe benhamii, Blechnum durum, Acaena Antarctica var minor. Collected up to 300m .

9. North Harbour. High Rata forest eaten out, goats seen, wind damaged. Small amount of Polystichum vestitum. M.divaricata, C. foetidissima on edges . Very wet litter and twigs.

10. Rose Island . Tussock with very built up plant bases. No snails visible. Rata forest, small patches of concentrated litter., all else eaten out.

11. Ranui Cove. Large flax belt near the shore. Undisturbed litter with twigs and branches under Rata.. Sealions positively evil. At 40m shrubby Rata, Dracophyllum, Myrsine and tussock.

OBSERVATIONS ON LANDSNAILS COLLECTED.

LIAREIDAE. Genus Cytora. Kobelt and moellendorf. 1897

Cytora cf hedleyi (Suter) Previously no recorded Liareidae on Subantarctic Islands. A new species showing some specialization from the mainland specimens. Found only at North Harbour, one sub adult and one juvenile.

Cytora new species. Another new record for the Auckland Islands. Found on Rose Island, two small adults and nine juveniles.

Genus Ranfurlya (Suter)

Ranfurlya constanceae (Suter) One only was seen though two possibles were collected from Disappointment Island on wet Pleurophyllum speciosa leaves. Both were out walking in the rain.. We had understood this species was very common and were surprised that this was not so. The animal first seen was collected under a wet branch at sea level at Epigwaitt. When in movement it appeared midway between a Schizoglossa and an Otoconcha. It was black with the internal shell partly visible and showed brown when the animal was preserved. The two animals from Disappointment Island were grey with a yellow sole, though this colouration disappeared after preservation of the animal.

ENDODONTINAE. Genus Charopa (Albers).

Ptychodon (Alsolemia) benhami. (Suter) The most common snail present at all sites from North and South. A very attractive golden coloured shell with fine ribbing. No shells showed any lamellae. They were generally seen in the top 2cm of soil and occasionally tucked into crevices of fallen wood. Not only under Rata forest but also out in the open in tussock fields.

Phenacharopa pseudanguicula. (Iredale) Not present in great numbers but collected at Erebus Cove, Hanfield Inlet, and on Adams Island. All were live collected from damp twigs and under loose bark. Some were out promenading after rain ceased. Sturdy shell appearance by contrast with other local snails, colour very dark.

Genus Allodiscus. Pilsbry.

Allodiscus planulatus. (Hutton) Present at most sites, likes moist situations and as at the Chatham Islands a number were found in the rotten white wood of very old Dracophyllum sp. Shell very pale with pinkish stripes, very finely ribbed.

Therasiella antipoda (Hombron and Jacquinot) A very beautiful snail found in singles at several sites, and out walking by day. The shell is very handsome with distinctive sculpture of radial riblets and minute axial threads. Colour horny with reddish flashes. This is an Auckland Island endemic.

PUNCTIDAE.

Punctid new sp Auckland Island. Very common throughout and unusual in that the sculpture was minimal and appeared almost obsolete, shell transparent pale straw colour. Found at Fairchild's garden, but not in the tussock at Erebus Cove, though this could have been the result of hasty collecting. On Enderby Island in the sandhills inland from Sandy Bay many sub fossil shells were found. One hundred of this punctid and only one specimen of Ptychodon benhami. The early vegetation must have been unsuitable in some way for the Ptychodon.

Punctid new species cf giganteum. Found only at 250m on Adams Island. A new species with affinities to Punctid giganteum of Campbell Island. Smaller than that species and living in fine grit at the base of a rock wall.

Punctid new sp 1. A minute specimen from 300m under tussock at Erebus Cove, and another at Ranui Cove possibly from under tussock patch also. On Erebus Cove ridge found together with Punctid new sp 2.

Punctid new sp 2. Slightly larger than the snail above. A species with close fine sculpture, pinkish buff in colour with a closed umbilicus. Found at Hanfield Inlet, Erebus Cove, Waterfall Inlet.

Punctid serratocostata (Webster) Slightly steeper angled profile, finer sculpture and paler straw colour than mainland specimens. Found only at three northern sites.

Taguahelix campbellica. (Filhol) Very fine dark shell with a greenish cast, umbilicus nearly closed, radial ribs and axial threads very fine but distinct. Not in great numbers but present throughout. Sometimes in litter and also at 1.5m on live bark with crevices. Good numbers on Rose Island in deep Dracophyllum litter.

Taguahelix delicatula. (Powell) Endemic to Auckland Islands, a small finely sculptured shell dark greenish in colour, more common in decaying Rata litter and top 2cm of soil. Again a very beautiful shell and present in small numbers at most sites.

Taguahelix hirsutus. (Powell) Another of the very finely sculptured greenish shells, globose with radials having hairlike processes. When live the tips of these processes were not tapered but very blunt. First found at Enderby Island in good numbers in the Rata forest remains. Also under dwarfed Myrsine with no easy access underneath for rabbits, no suitable food either. Found at 300m above Erebus Cove in tussock base, also at Hanfield Inlet in leaf slime and under P. speciosa in Fairchild's garden on Adams Island

Punctid cf hirsutus. New species, one found at Epigwaitt, four at E rebus Cove shore collecting. This species has similar sculpture to hirsutus but there is no sign of processes past or present on live collected animals.

Taguahelix subantarctica. (Suter) Very few seen, one good specimen found at Hanfield Inlet in Dracophyllum litter and subsequently lost. Singles at Adams Island , 300m above Erebus Cove and at Epigwaitt. This is distinguished by having a broad colour pattern of reddish brown on straw.

Genus. Obanella (Dell)

Obanella allanae (Dell) A slightly damaged shell but compares with the mainland form, only one collected, from Tandy Inlet. A new record for the Auckland Islands.

Reflectopallium marmoratum (Simroth) An Auckland Island endemic and very prevalent, under loose bark up trees, and at ground level at all sites. On

Disappointment Island the slugs seen on vegetation were larger and greenish in colour, but it is possible they are only further colour variation. There were those with black base and brown streaks, dark brown with buff streaks, buff with pink streaks, and grey with transparent. Best collect seven seen under one small rotting branch.
An introduced slug species was seen at Ranui Cove.

DISCUSSION.

The snail fauna has been increased by five species and it is probable with further work that there are a few more shy species waiting to be found. However it is of great importance that the Northern areas have introduced animals removed, as it is here that the greatest number of species occur, and it might not be too late to allow the regeneration of some nearly extinct species. More work needs to be carried out at higher altitudes and a fine landing at Disappointment Island might increase the number of species here also.

We were lucky to be working in good weather conditions and as a result were delighted by the number of live animals seen. The total number of species seventeen, is surprisingly high for such an isolated island group.

ACKNOWLEDGEMENTS, with thanks to,
Lands and Survey Department, for permission to carry out this fieldwork.
Dr F. Climo, for identification and encouragement.
Capt A. Black and team of Research Vessel "Acheron "

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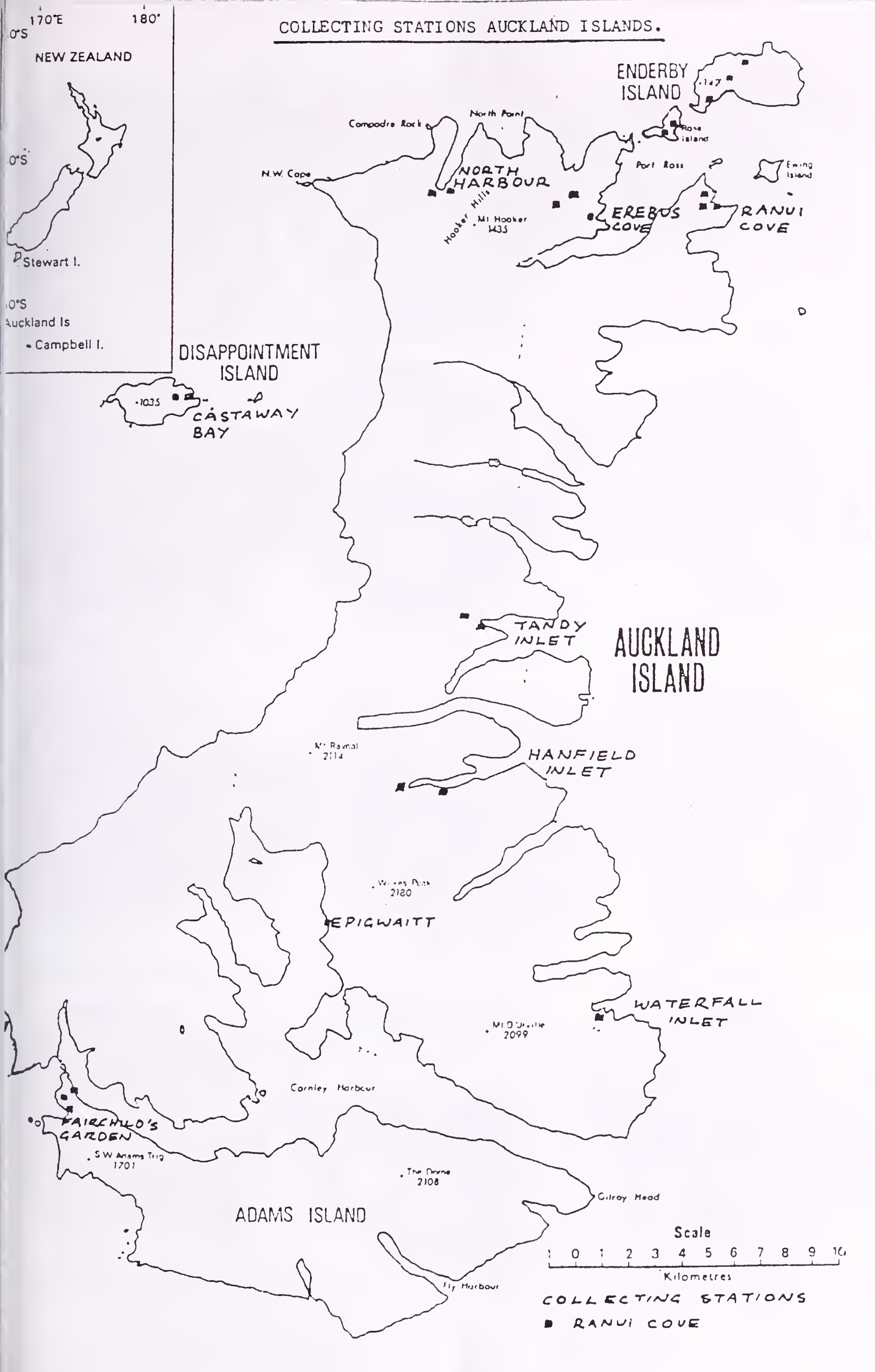
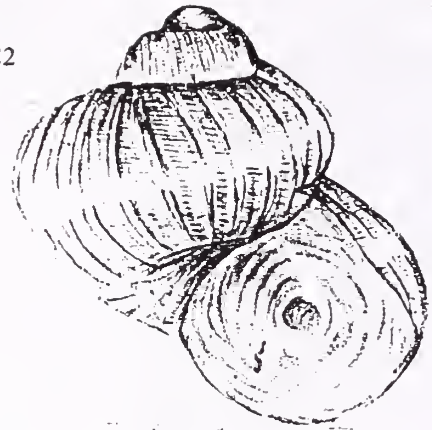
	A	Erebus Cove Ridge	Erebus Cove Shore	Enderby Island Circut	Enderby Island shore bush	Enderby Island Sandhills	Tandy Inlet	Hanfield Inlet A.	Hanfield Inlet B	Waterfall Inlet	Epigwaitt	Adams Island Shore	Adams Island meadow	Disappointment Island	North Harbour	Rose Island	Ranui Cove
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14	Cytora cf hedleyi														2		
15	Cytora new sp														1	11	
16	Ranfurleya constanceae										1			2			
17	Ptychodon benhami	12	4	11	108	1	74	11		69	78	20	43	29	50	3	38
18	Phenacharopa pseudanguicula	8					2	4				4			2		1
19	Therasiella antipoda						5					1		1			1
20	Allodiscus planulatus	8	7		4		5	6	5		2				11		3
21	Punctid aucklandica	11	32	23	30	100	18		6	2	15	34	51	23	2		15
22	Punctid n sp cf giganteum												25				
23	Taguahelix campbellica	18	4	15	8		5	1	2	2	1	14	1		3	16	22
24	Taguahelix delicatula	6	4	1	23			3		6	1	9	2		9		10
25	Taguahelix hirsutus	2		12	39		1		23			1	3	4	4	15	10
26	Taguahelix cf hirsutus	4	4							1	1						
27	Taguahelix subantartica	2						1	2		1	1					
28	Punctid serrato costata		6	1	11												
29	Obanella cf allanae						1										
30	Punctid new sp 1	2															
31	Punctid new sp 2	6							8	1						1	
32	Reflectopallium marmoratum	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

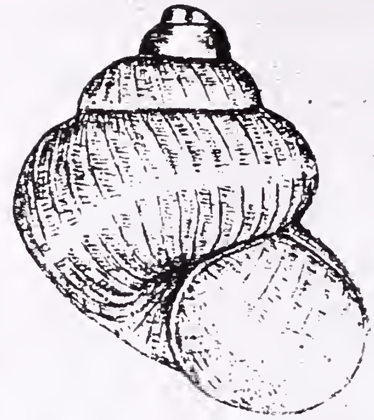
COLLECTING STATIONS AUCKLAND ISLANDS.





Cytora hedleyi (juvenile) cf.

1.3 x 1.3 mm.

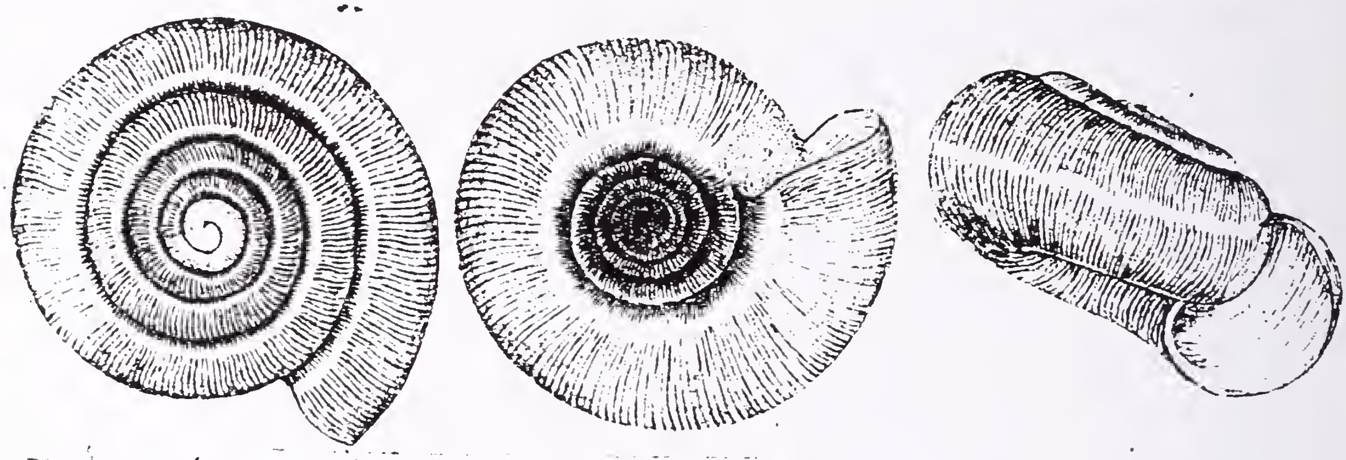


Cytora new species

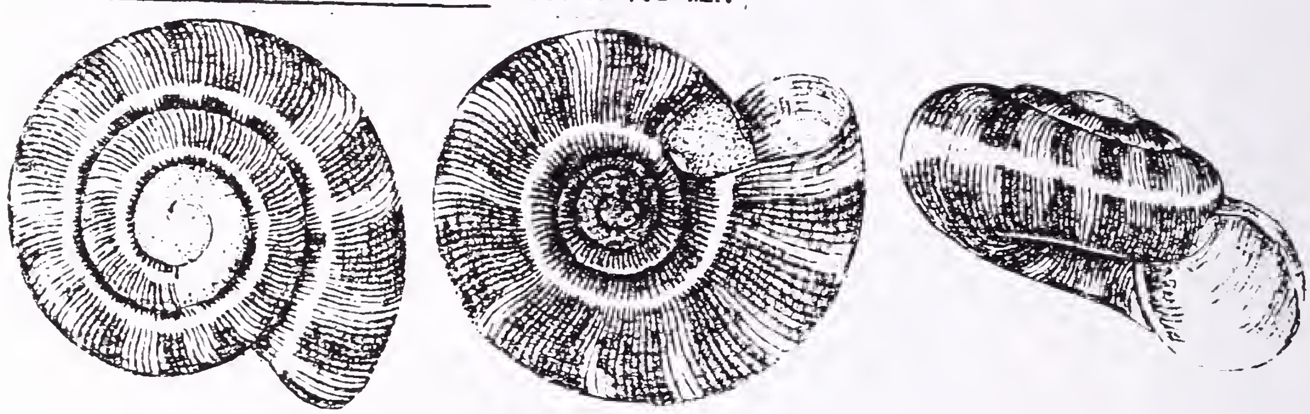
1.4 x 1.5 mm.

Ranfurlya constanceae

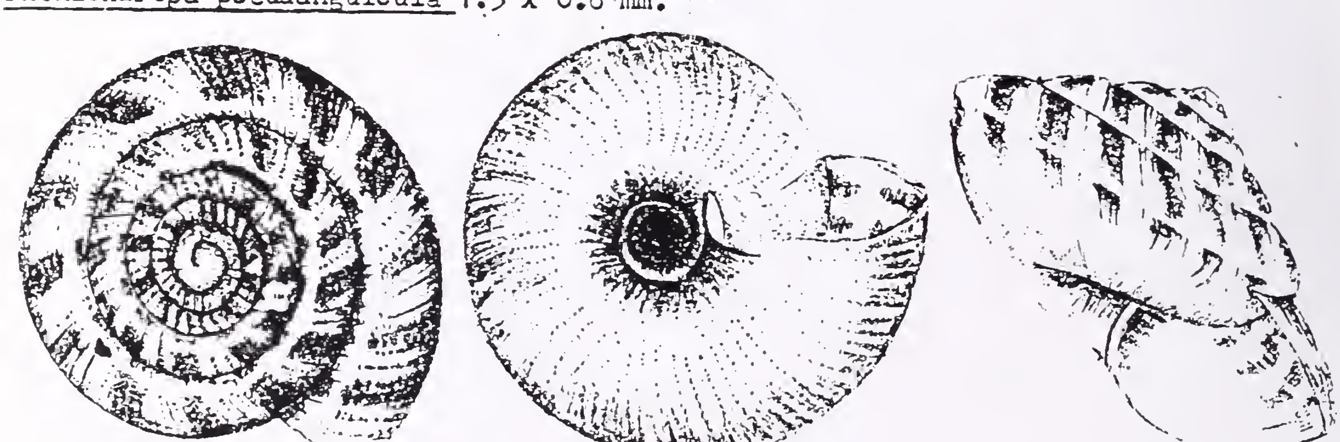
1.5 cm.



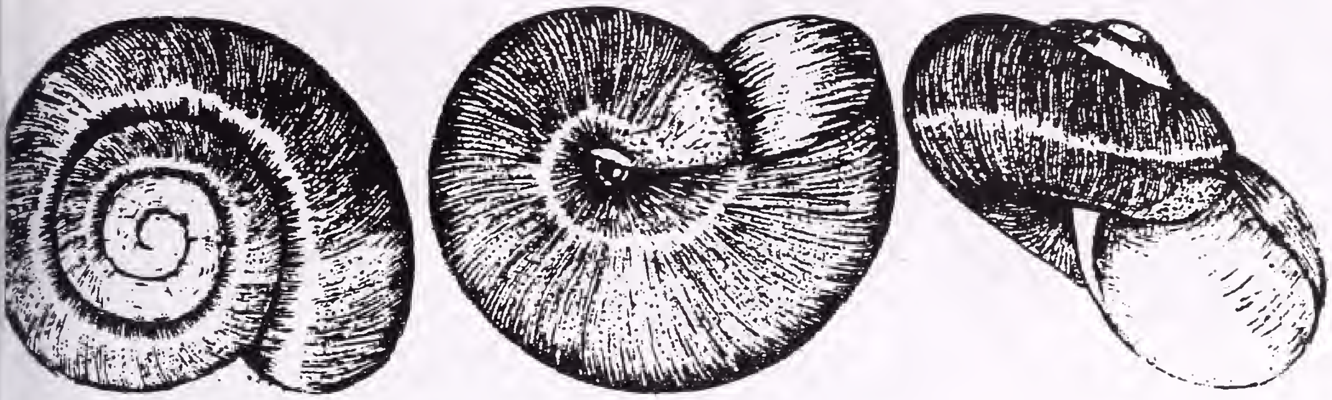
Ptychodon (Alsolemia) benhami. 2.6 x 1.2 mm.



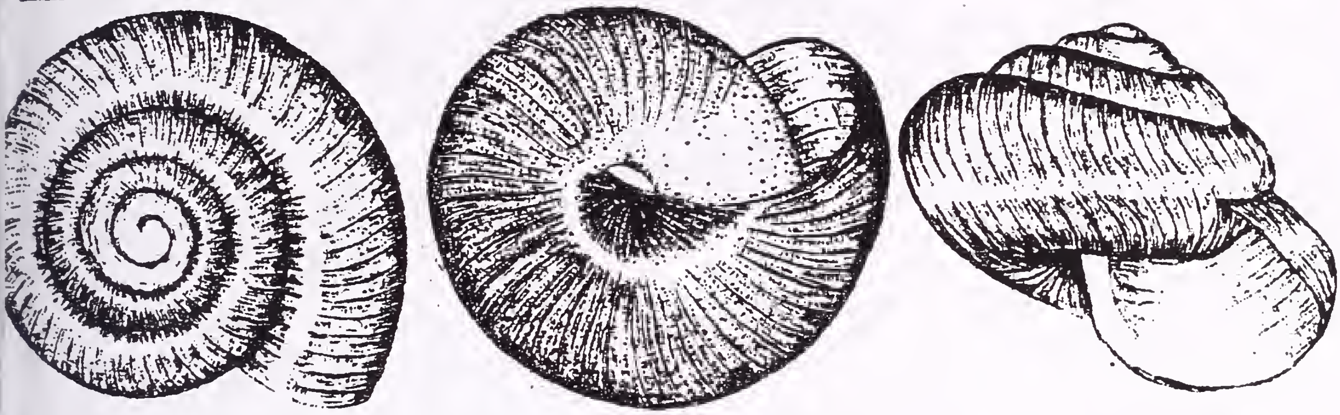
Phenacharopa pseudanguicula 1.5 x 0.8 mm.



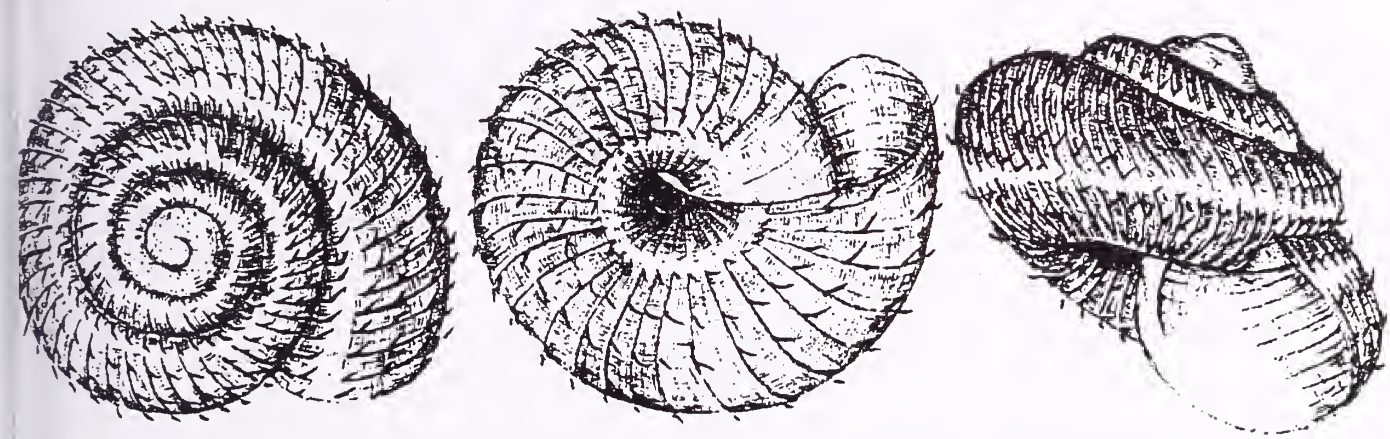
Punctid antipoda 7.4 mm



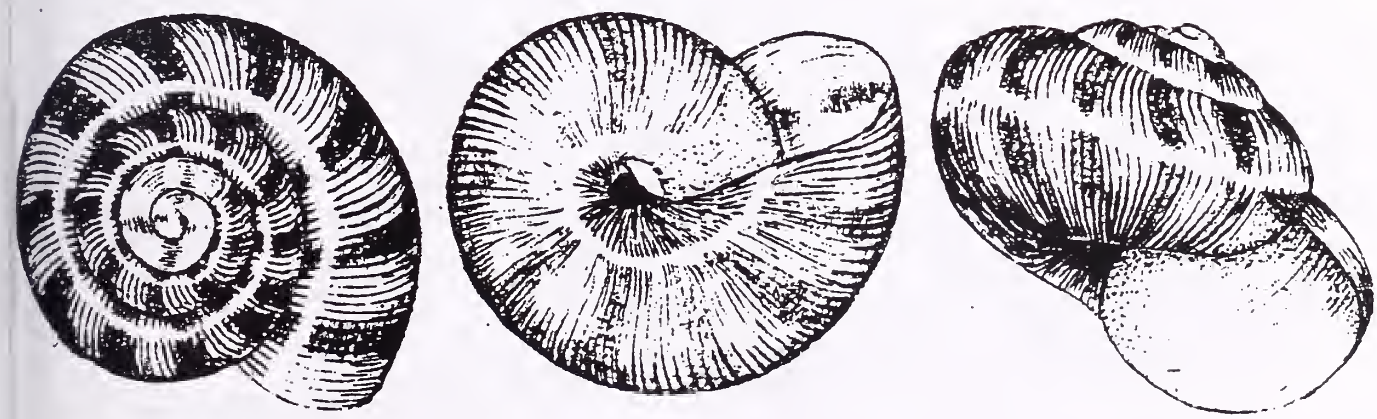
Taguahelix delicatulum 2.3 x 1.4 mm.



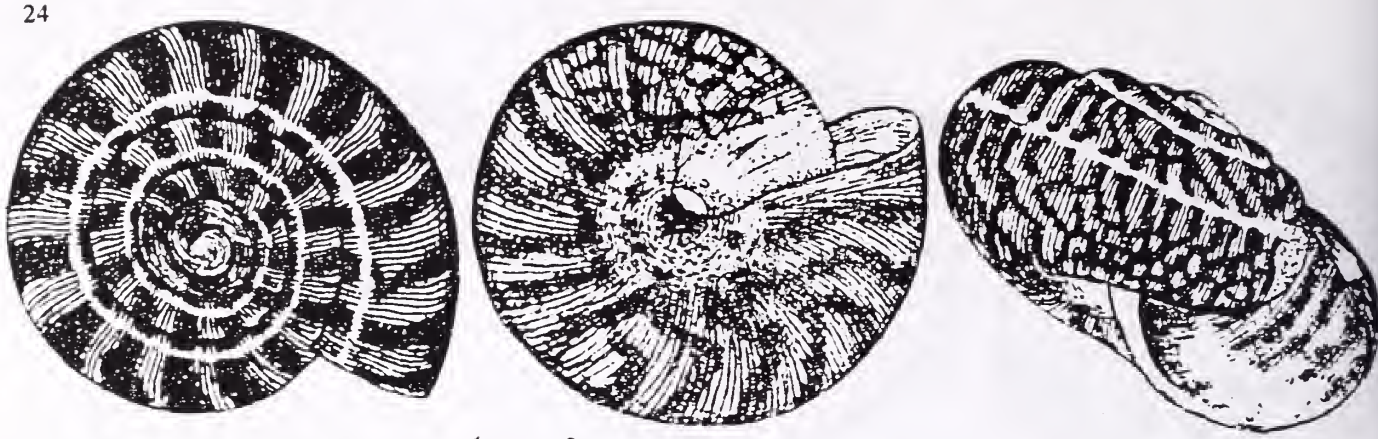
aguahelix cf. hirsutus 2.7 x 1.9 mm.



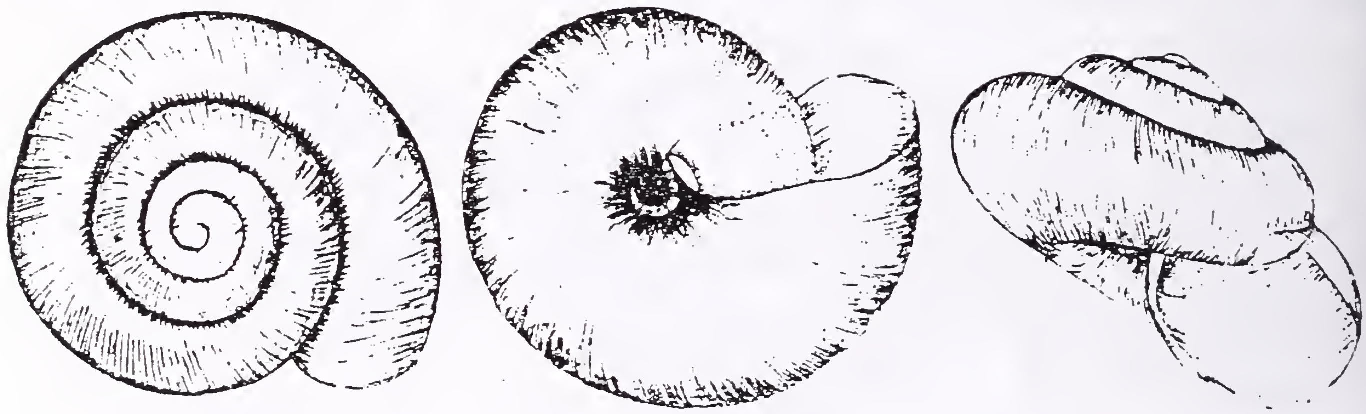
Taguahelix hirsutus 3.0 x 1.9 mm.



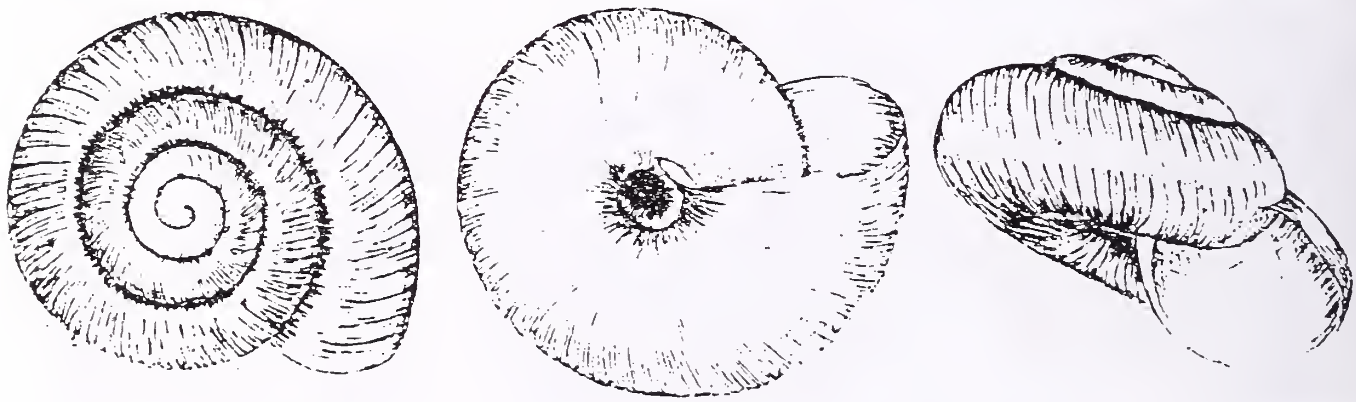
Taguahelix subantarctica 3.0 x 1.8 mm.



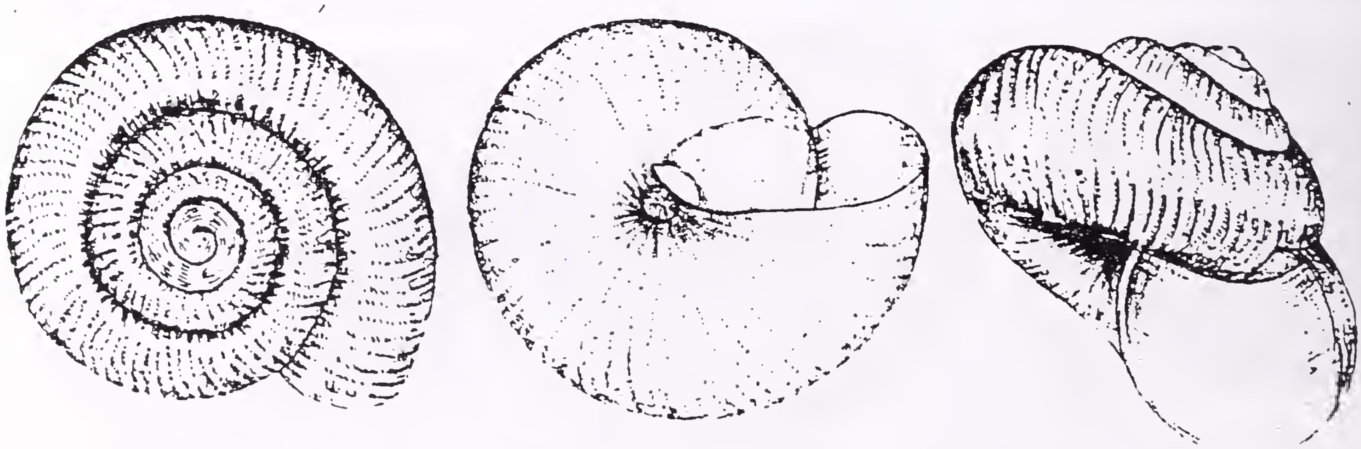
Allodiscus planulatus. 3.5 x 1.8 mm.



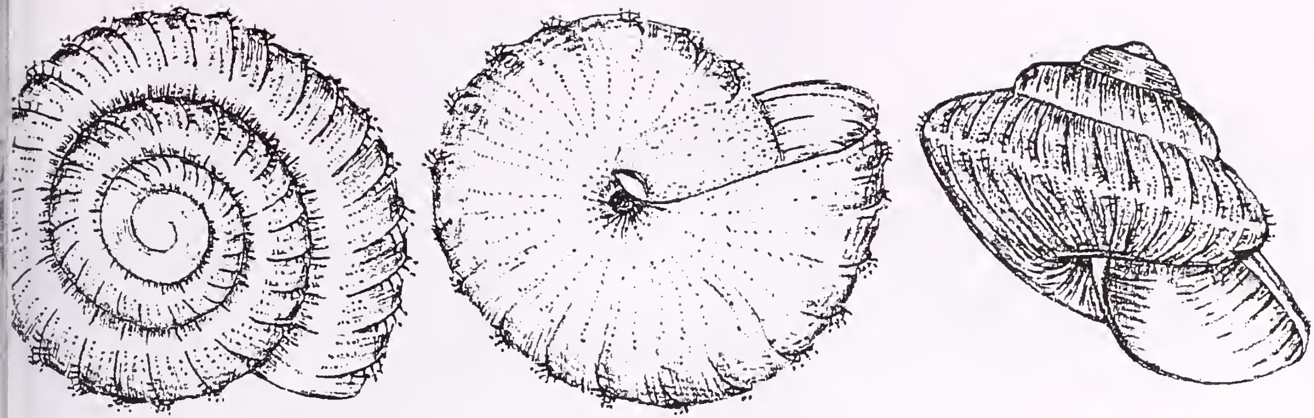
Punctid "aucklandica" 1.6 x 1.0 mm.



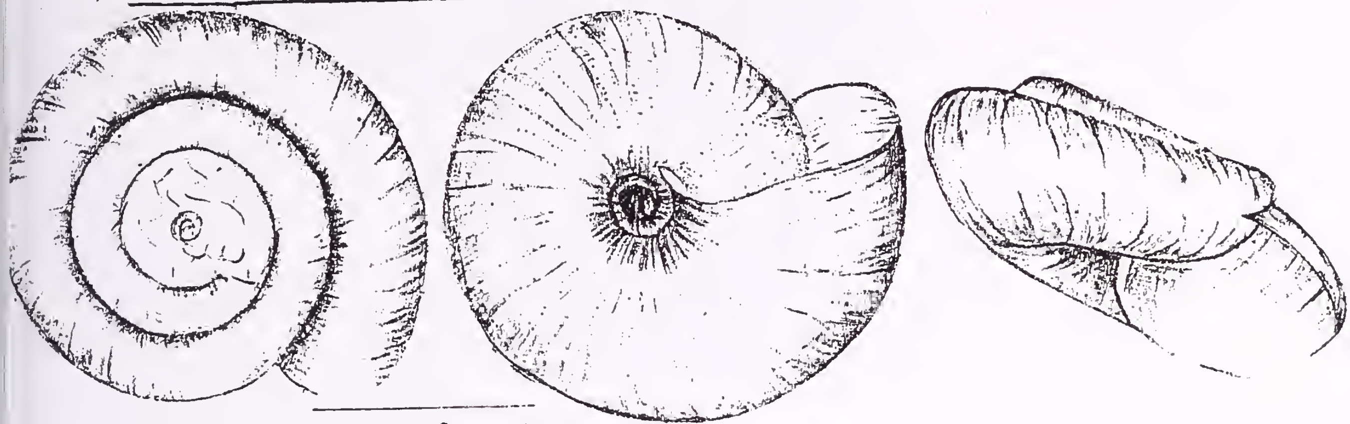
Punctid n sp cf giganteum 1.8 x 1.0 mm



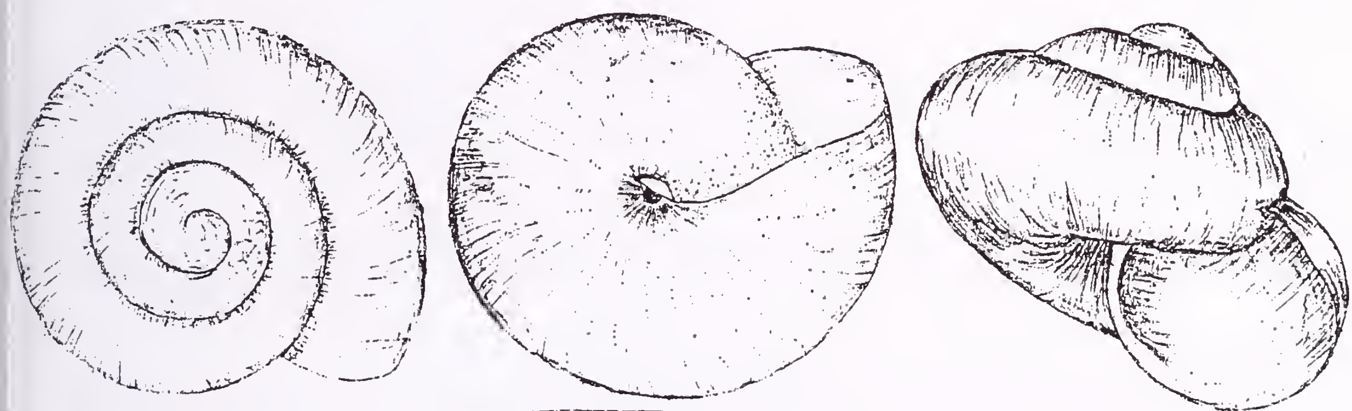
Taguahelix campbellica 3.0 x 2.2 mm.



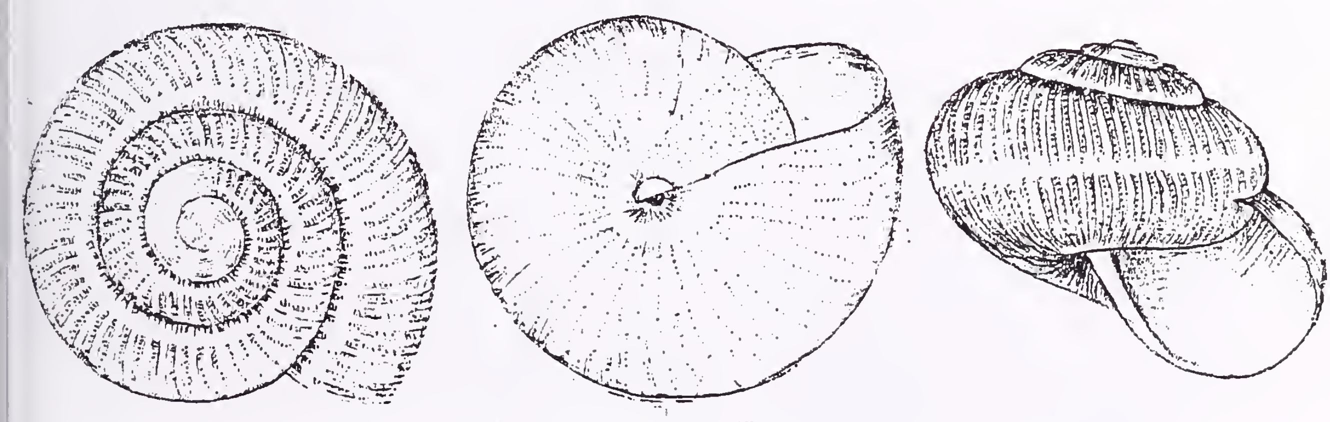
Punctid serratocostatus . 1.2 x 0.8 mm.



Obanella allanae cf. 1.8 mm.



Punctid cf. n.sp. 20. 1.2 x 0.8 mm.



Punctid n.sp. cf. n.sp. 20 . 1.4 x 0.9 mm.

This is a rough draft of a document Jim started in 1991, but subsequently decided not to follow up. We thought it worth recording, particularly to preserve the drawings.

SOME NOTES ON THE GENUS THERASIELLA Powell.

J.F.Goulstone, 1991

This attractive group of small snails was last reviewed by Cumber in 1967. (Trans. Roy. Soc. N.Z. Zool., Vol. 10, No. 7, pp 61–70.). He recognised five species on the mainland and one on the Three Kings Islands. On the face of it this work is comprehensive but the last twenty years have seen some very intensive collecting and the material in some cases falls outside the scope of Cumbers review. This article tries to address these shortcomings or at least throw some light on the grey areas.

Therasiella as a genus is distinguished by the elaborate membraneous plates covering the shell and it it is the variations of this feature which largely distinguish the various species. Unfortunately one of the properties of these plates is to collect dirt and it is almost impossible to find a clean specimen, or one with any processes intact. Add to this the distortion which occurs to plates when they dry on the dead snail shell and sorting can be made very difficult. There is a tendency to rely heavily on very juvenile shells which in itself can create problems, and of course Cumber himself noted all these difficulties.

Most of the variations come from the Far North and it would perhaps be easier to show these in a comparitive list, Cumbers on the left and my present appreciation of things on the right.

Therasiella pectinifera Powell	**Therasiella pectinifera** Powell
Therasiella celinde (Hutton)	**Therasiella celinde** (Hutton)
Therasiella tamora (Gray)	**Therasiella tamora** (Hutton)
	Terasiella cf tamora
Therasiella neozelanica Cumber	**Therasiella neozelanica** Cumber
	Therasiella cf neozelanica
	Therasiella n.sp. North Cape.
Therasiella serrata Cumber	**Therasiella serrata** Cumber
Therasiella elevata Cumber	**Therasiella elevata** Cumber
	Therasiella cf elevata

I have mostly just drawn a lot of pictures to illustrate the above differences, some from my own collection others from the National Museum, many from Pauline Mayhill. The S.E.M's were kindly given to me by Frank Climo.

Celinde appears to be constant over its whole range with perhaps longer processes in the North Cape block, as also noted by Cumber.

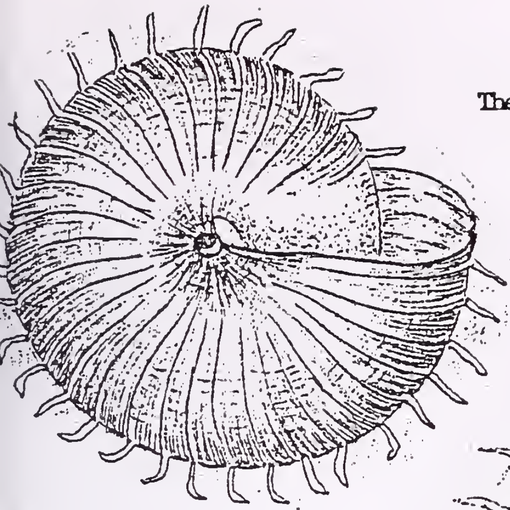
Tamora which is a largish shell and constant over much of its range becomes smaller and quite variable north of the Mangamukas. Wether this is another species is open to conjecture but it is a difference worth recording.

Neozelanica has long been recognised to hold another species and I think it is possible to separate the two on shell features even without the processes.

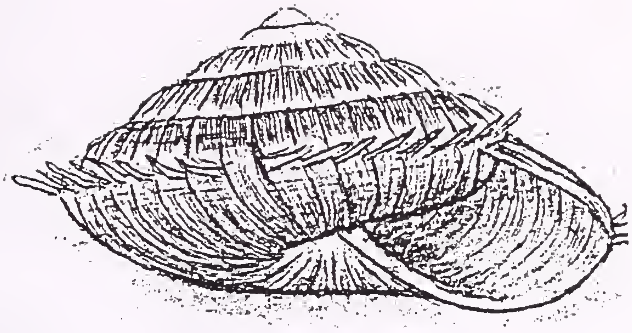
N.sp. North Cape. These specimens were labelled **cf neozelanica** on the National Museum tube I borrowed but the rounded processes could perhaps give it more affinity with **tamora.** To me though it seems quite a unique snail.

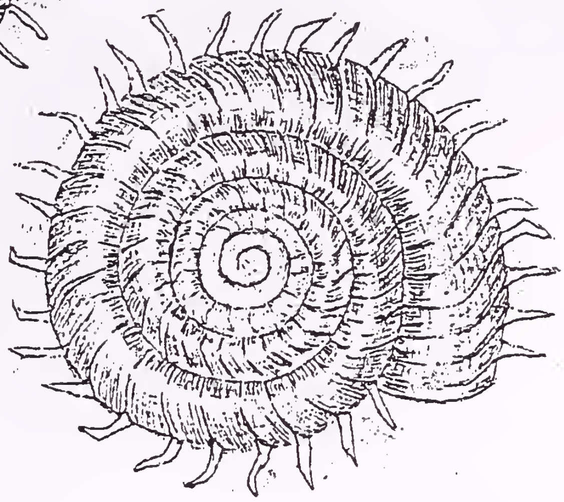
Serrata is a striking snail which has a constant appearance but a specimen from Mangamuka had no hairs underneath.

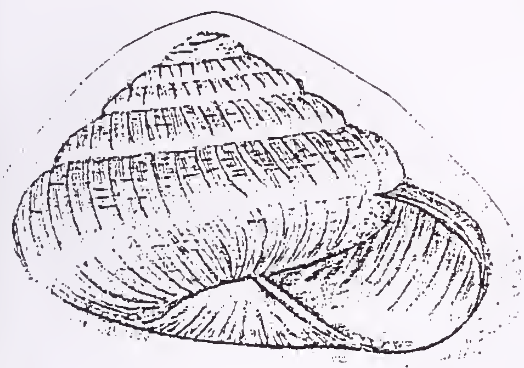
Elevata seems good as far as Cumber described it but there is a vast amount of material in the far north with affinities to both **elevata** and **serrata** but not falling properly into either group as he defined them. Perhaps there is another species involved or some sort of hybridization is occuring. This other material has serations on the plates and hairs underneath, either, both or none. In shape it is quite constant falling midway between **elvata** and **serrata.** The plates are never well developed and the processes tend to be sparse and erect. The umbilicus is either small or very small and a surprisingly constant feature is a bulge or callus on the collumella .



Therasiella celinde
Te Paki,
4 x 2.6 mm.

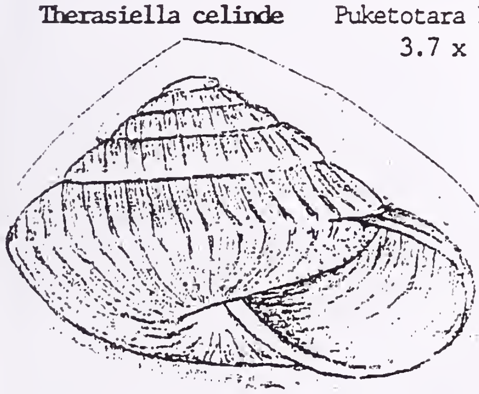


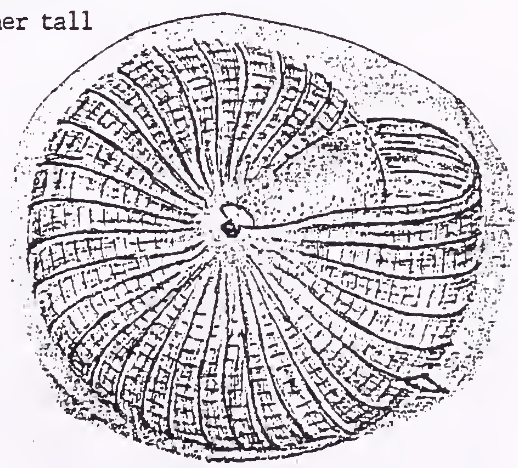


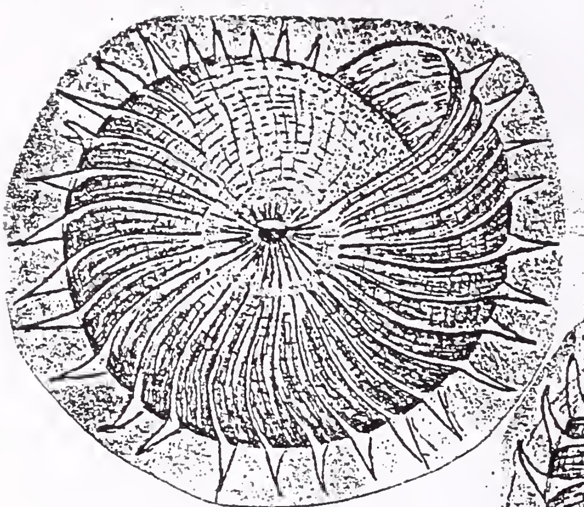


Therasiella celinde Pandora M02 894 492 coll. P.Mayhill
4.4 x 3.4 mm. This was a well developed shell and
quite rounded on the body whorl.

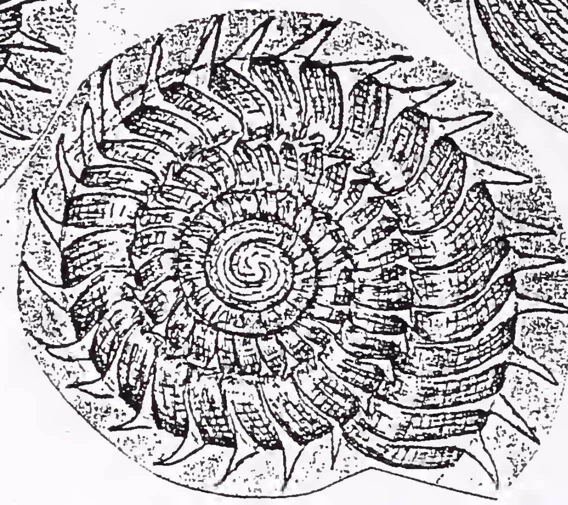
Therasiella celinde Puketotara Rd. east of Puketi. P05 896 616 coll. P.M. 11/87.
3.7 x 2.6mm. a rather tall
shell

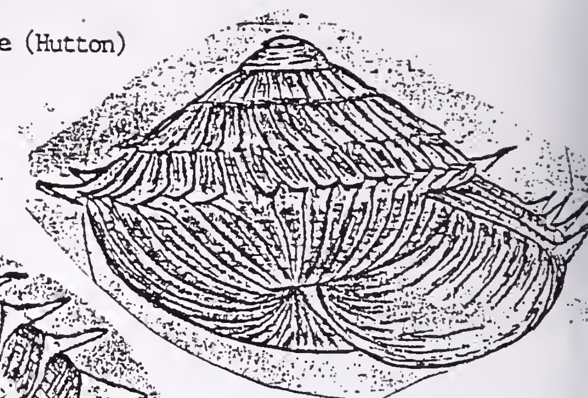




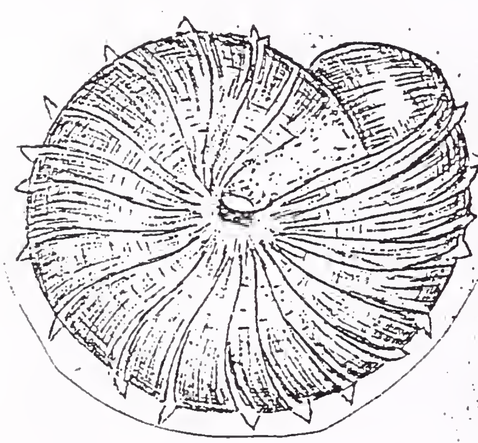


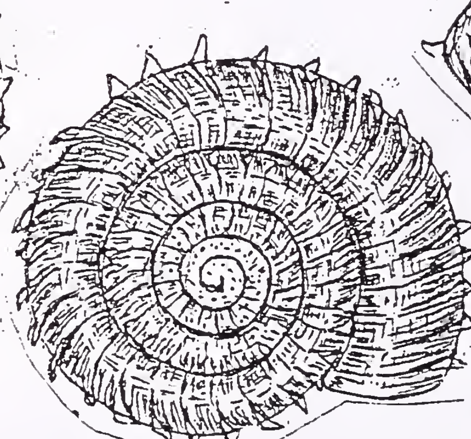
Therasiella celinde (Hutton)
Mt. William Reserve
Bombay
3.5 x 2.4 mm.

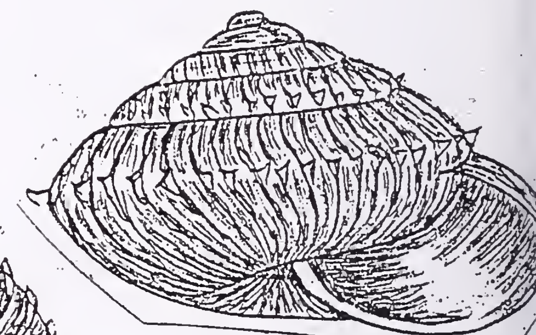




Therasiella celinde
Coromandel
4 x 2.5 mm.

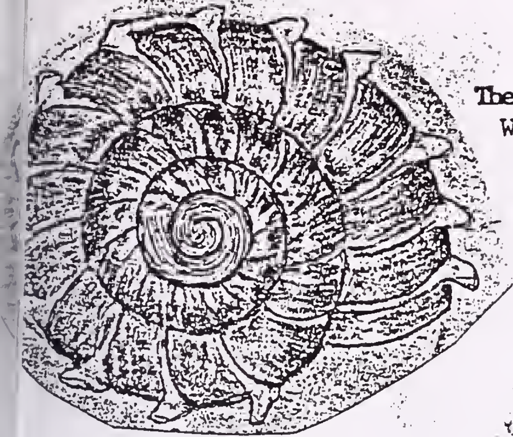




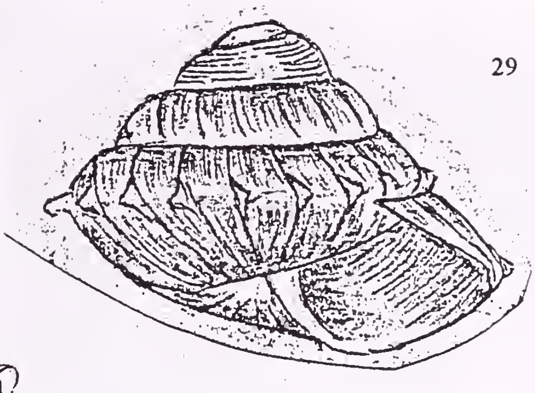


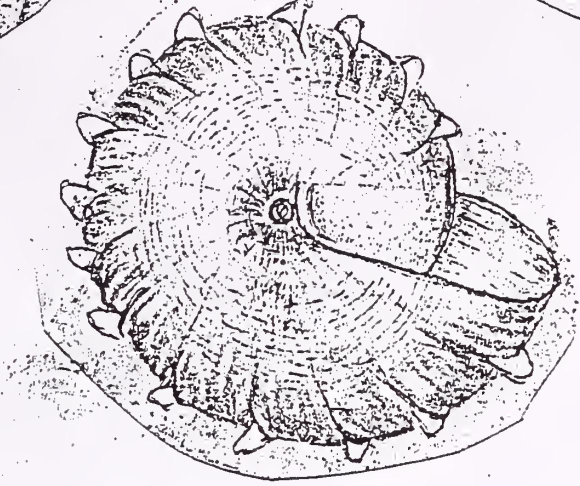
celinde Kawhia

The processes on **celinde** are always weak and give the impression of being pointed which is how I have drawn them but the S.E.M. shows them in fact to be rounded though narrow. **celinde** is a lighter horny colour compared with **tamora** which is a richer darker brown and more opaque.

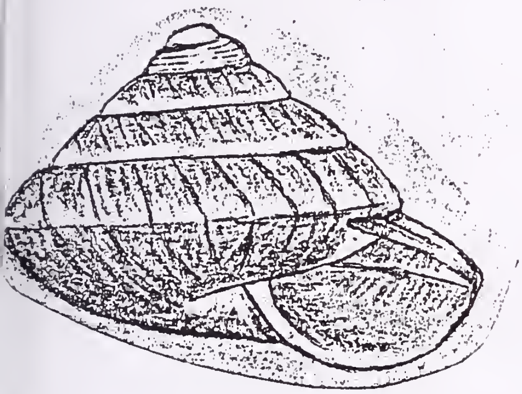


Therasiella cf tamora
Waihi st.ream, Unawhao
2.1 x 1.8 mm
A juvenile but very
tall.

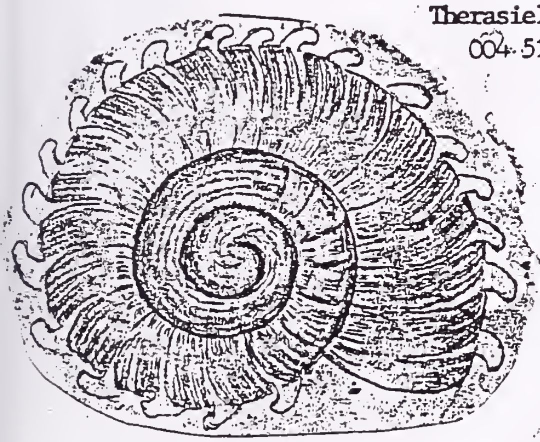


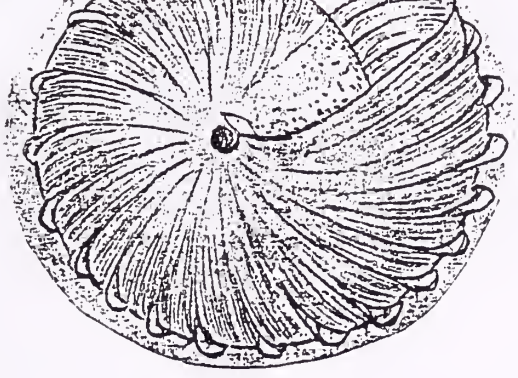


Therasiella cf tamora Waitanoni Stream, Kapowairua,140 m.
M02001 525 N.M.NZ. 11/86 An older tall variety. coll. E.Ogle
3.2 x 2.4 mm.

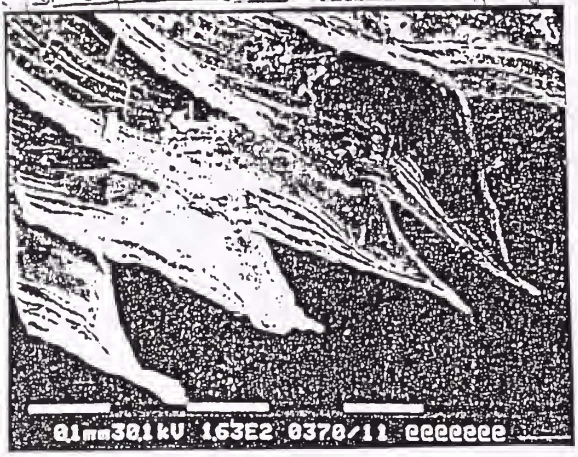


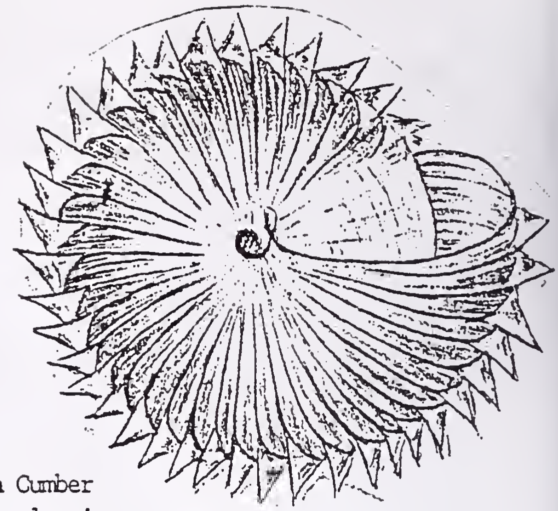
Therasiella cf tamora Paranui Scenic Reserve, East of Kaitaia
004 513 814 coll. P.M. 4/83



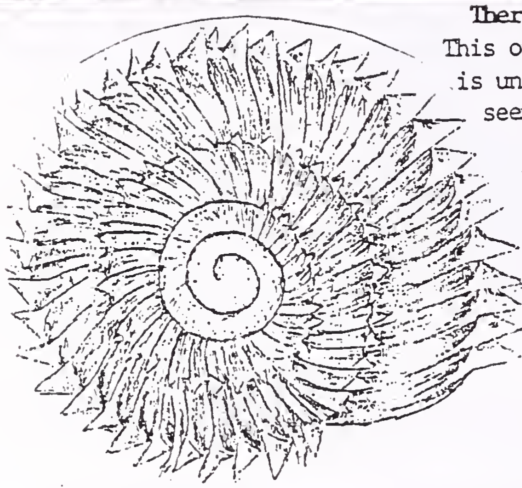


neozelanica Mt Ngongotaha

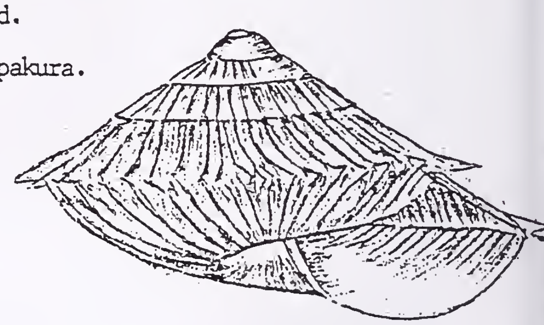




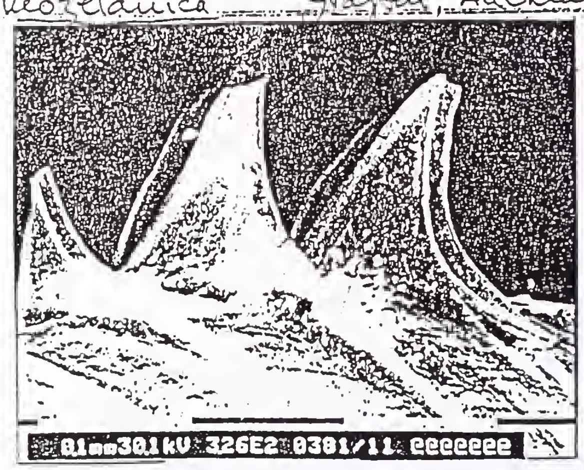
Therasiella neozelanica Cumber
This one with the bold overlapping processes is undoubtedly the one Cumber drew even although the holotype seems to have disappeared.



Ponga Rd. Reserve, Papakura.
3.2 x 1.8 mm.

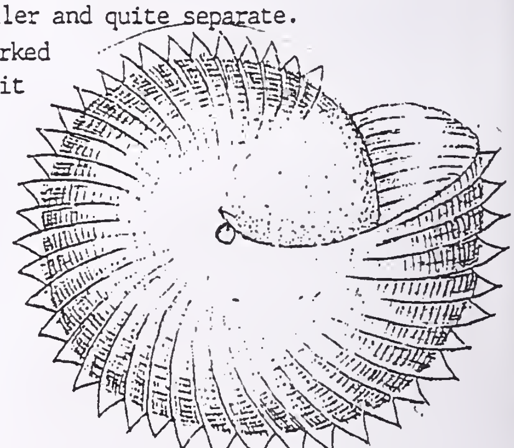


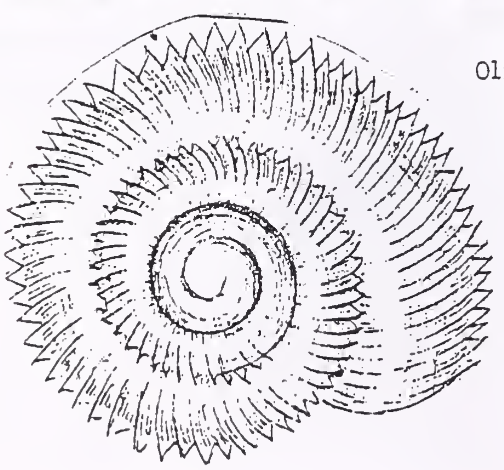
cf neozelanica Grafton, Auckland



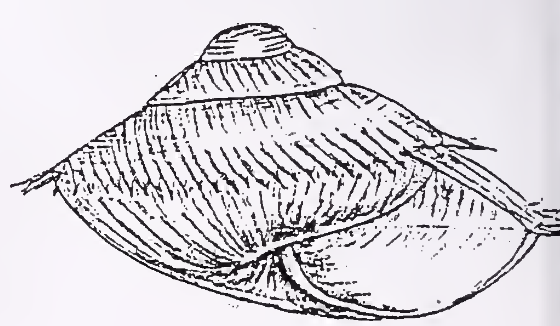
Therasiella cf neozelanica. A taller lighter coloured shell with finer processes onlyforming on the periphery, where they are smaller and quite separate.

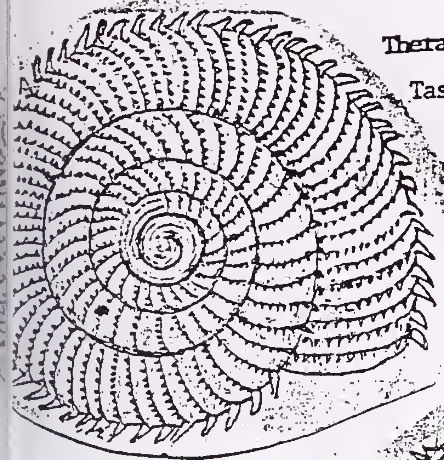
I haven't quite worked out its range but it could be as widespread as the former.





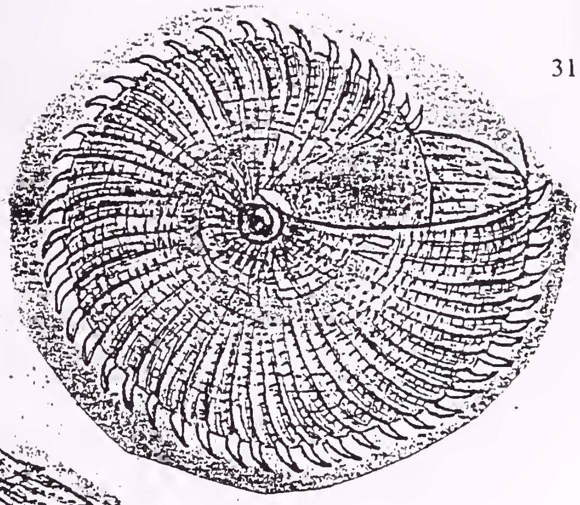
Olive Davis Reserve, Manurewa.
3 x 1.4 mm.

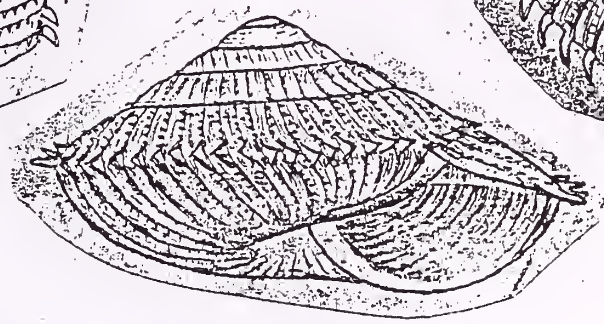




Therasiella pectinifera Powell

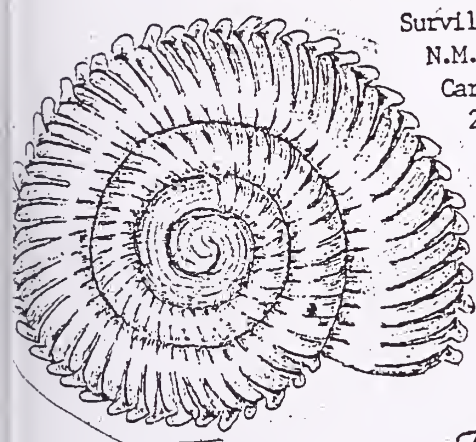
Tasman Valley S.W.Great King
coll. R.Willan 9/12/76
under Kanuka.
4.5 x 3 mm.

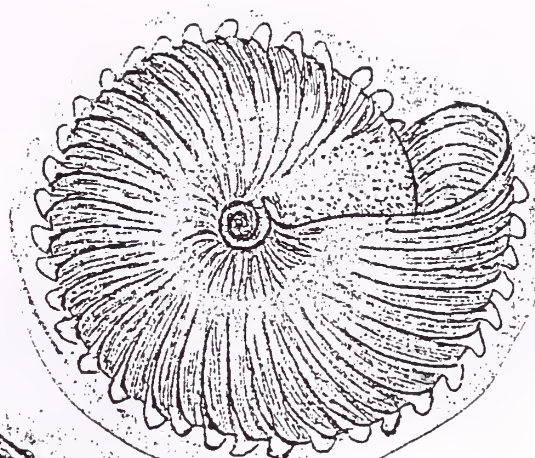


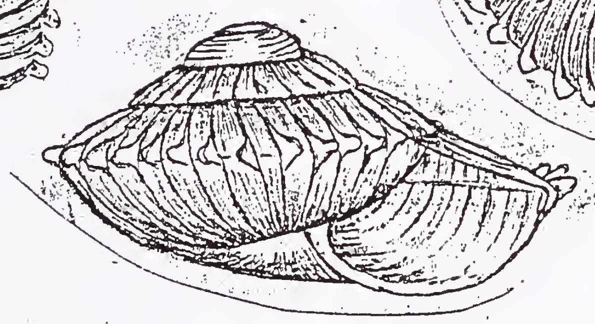


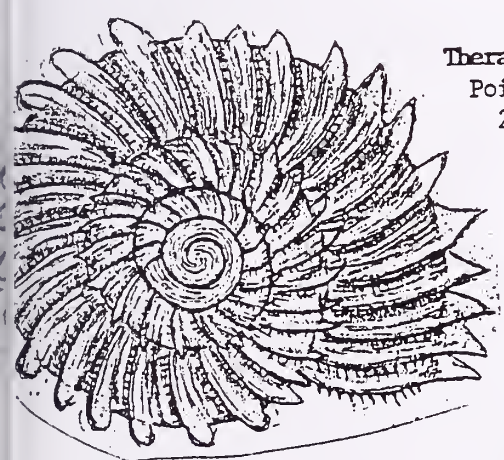
Therasiella n.sp.? North Cape.

Surville Cliffs, North Cape,
N.M.NZ. 76995 coll. Anderson,
Carlin & Ogle; 4/3/85
2.3 x 1.4 mm. a larger one
was 2.6 mm.



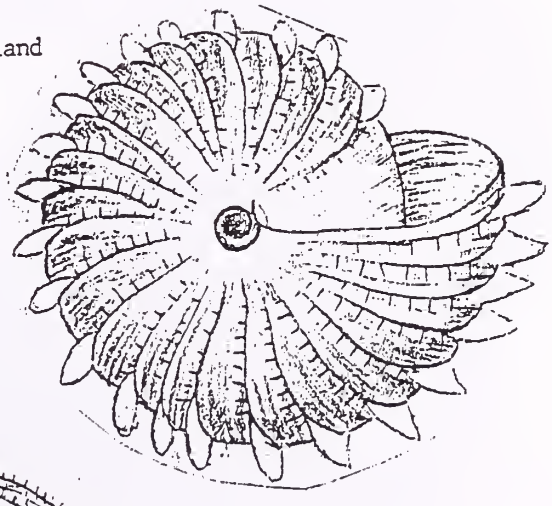


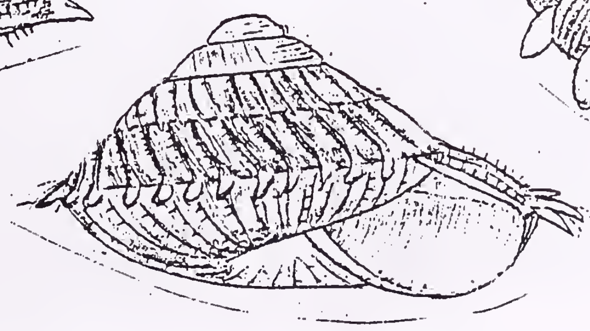


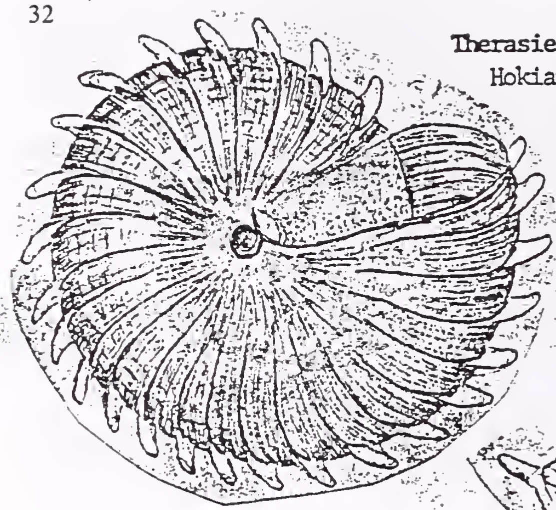


Therasiella serrata Cumber

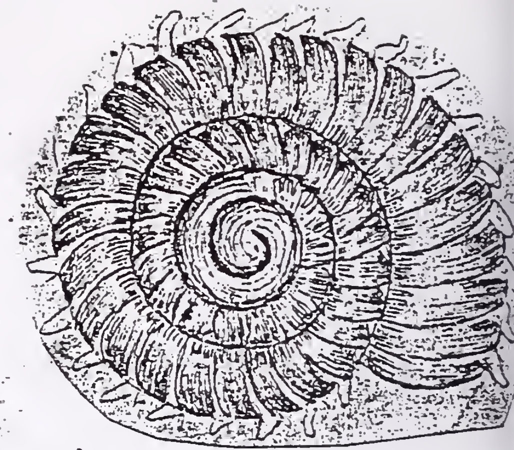
Point View Rd., Howick, Auckland
2.5 x 1.5 mm.

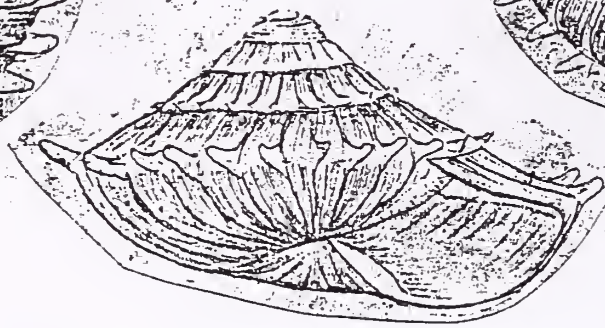




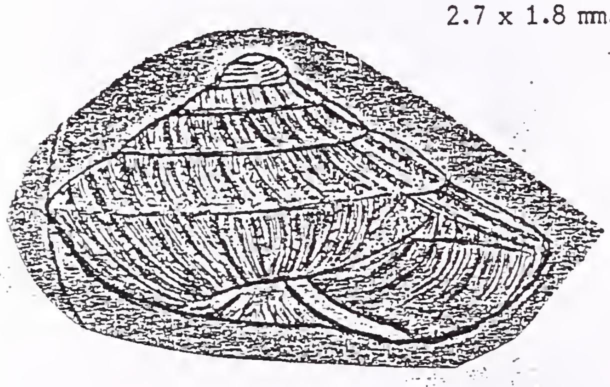


Therasiella cf elevata, Mitimiti, Hokianga. 5/90
2.2 x 1.5 mm No sign of serrations or hairs, but a bulge on the collumella.

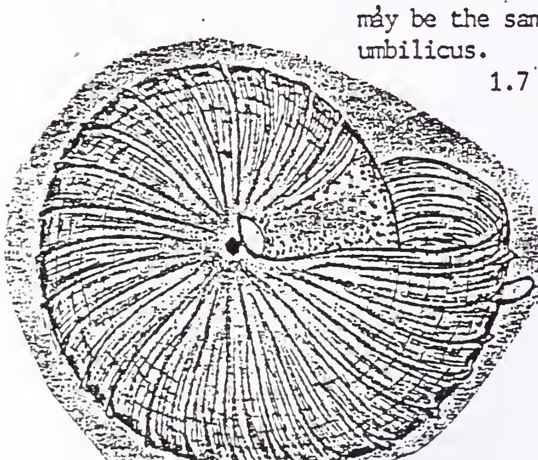


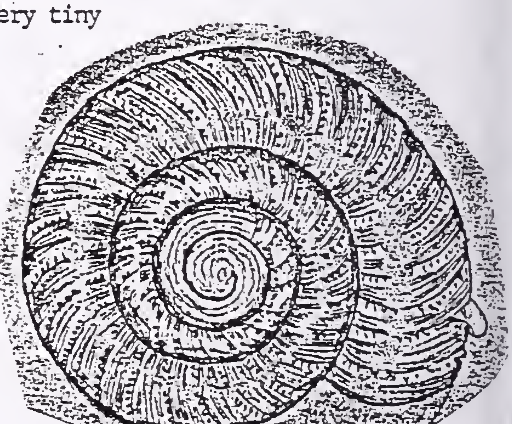


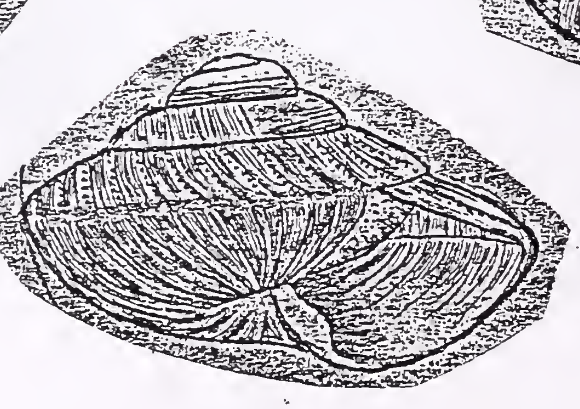
Therasiella cf elevata, Ranfurly Bay Track near Totara North, P04 765 855 coll. P.M. 11/88
2.7 x 1.8 mm.

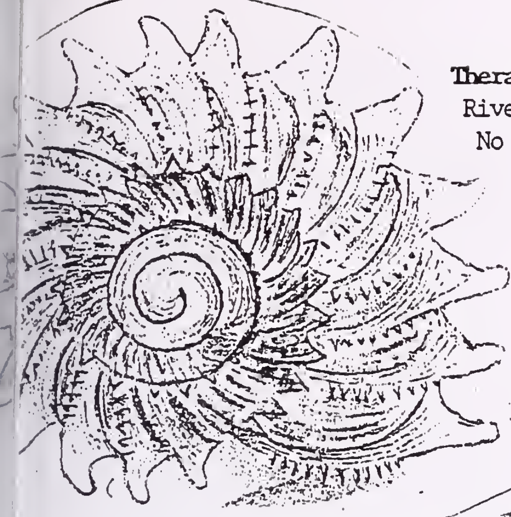


Therasiella cf elevata, Matihetihe 005 386 405, coll. P.M. 9/84 This is close to Mitimiti, above, may be the same spot, but this one has a very tiny umbilicus.
1.7 x 1.2 mm.

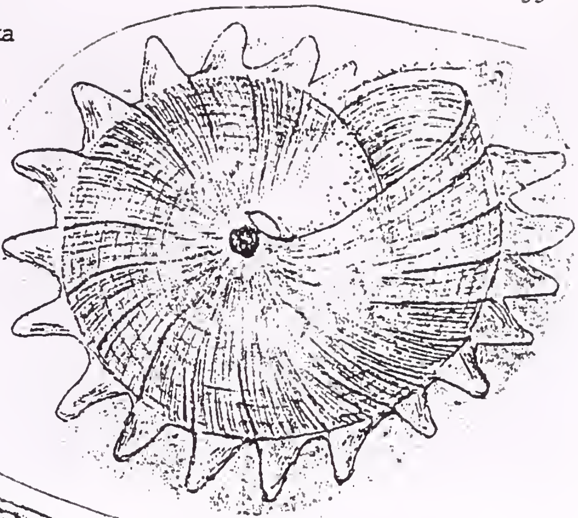


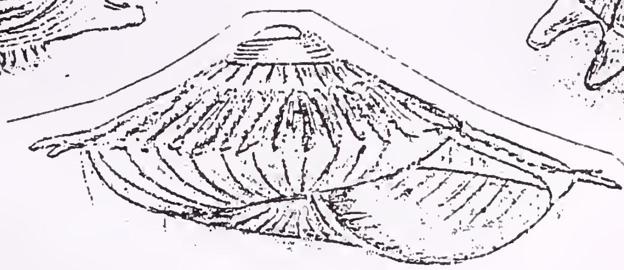




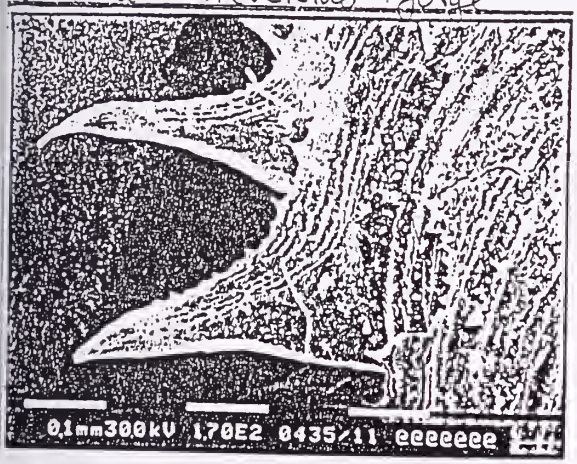


Therasiella serrata. Mangamuka River Bridge, coll: P.M.
No hairs on base.
3 x 1.4 mm.

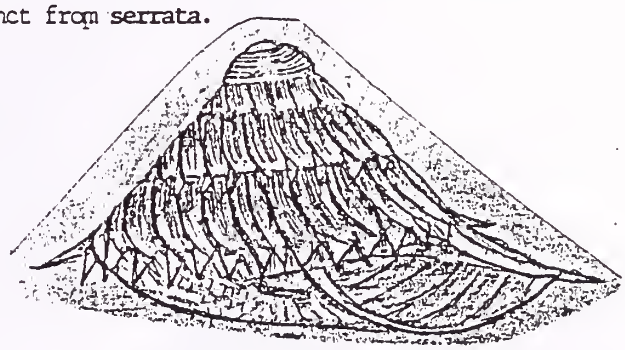




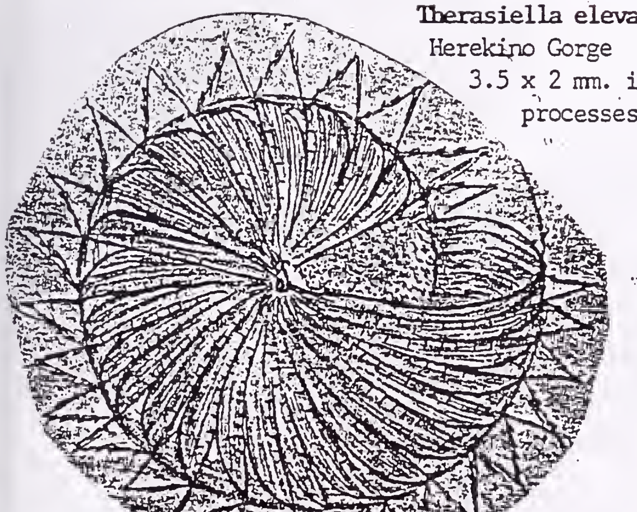
elevata Herekino Gorge

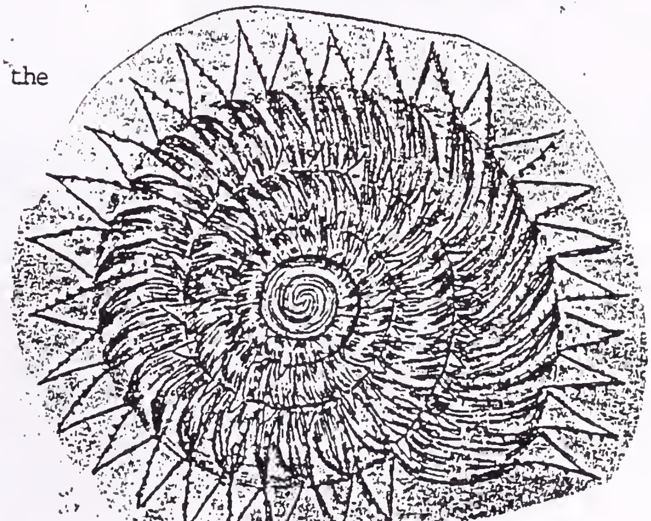


Therasiella elevata Cumber I didn't find all that common, or rather it was plentiful in a few sites but the sites were not many. It does seem quite distinct from **serrata**.

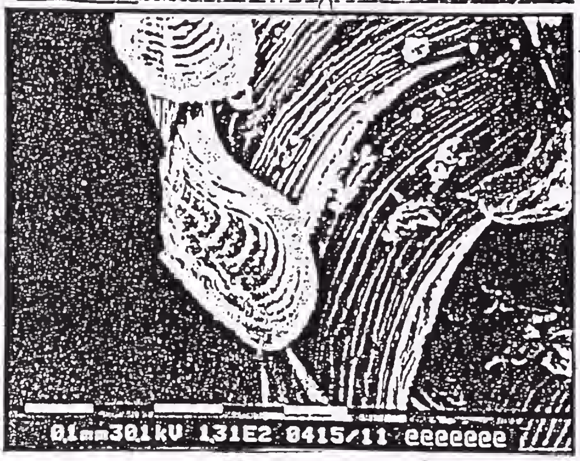


Therasiella elevata
Herekino Gorge
3.5 x 2 mm. incl. the processes

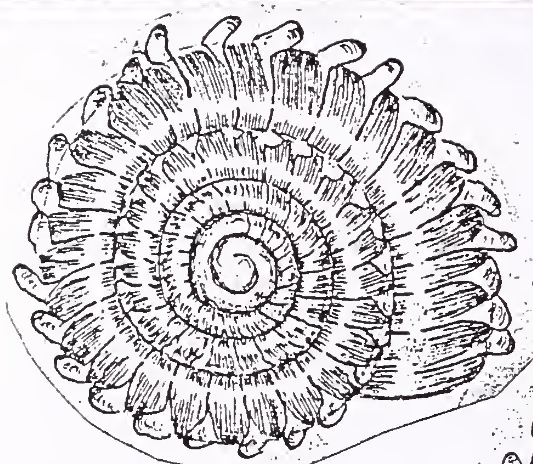




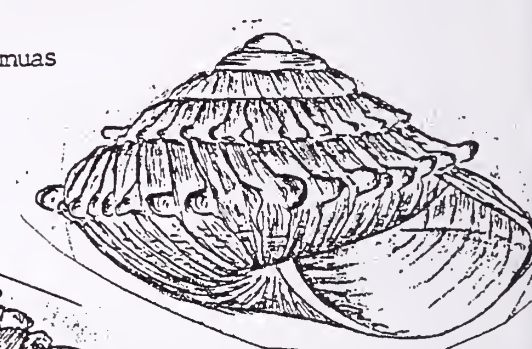
tamora Raglan

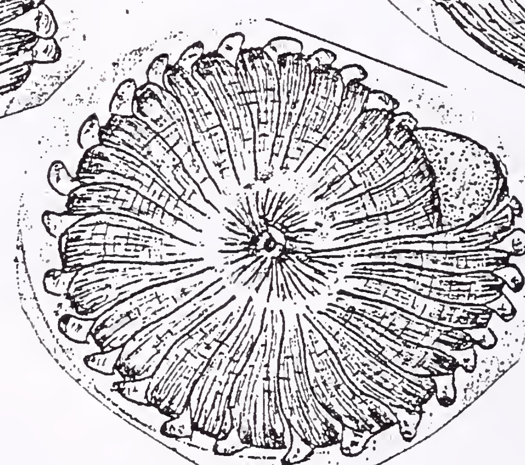


Therasiella tamora (Hutton) I have found around Auckland that if **Tamora** is prominent as in the Waitakeres, **celinde** is scarce, and vice versa.

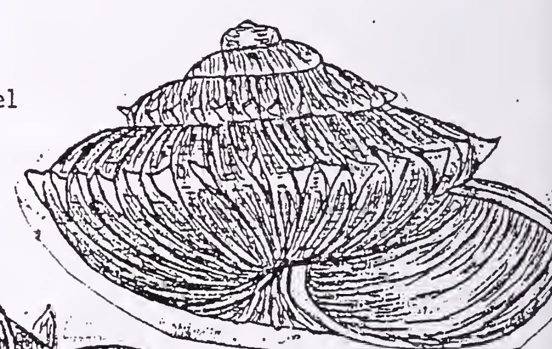


Therasiella tamora
Te Morehu Reserve, Hunuas
4 x 2.5 mm.

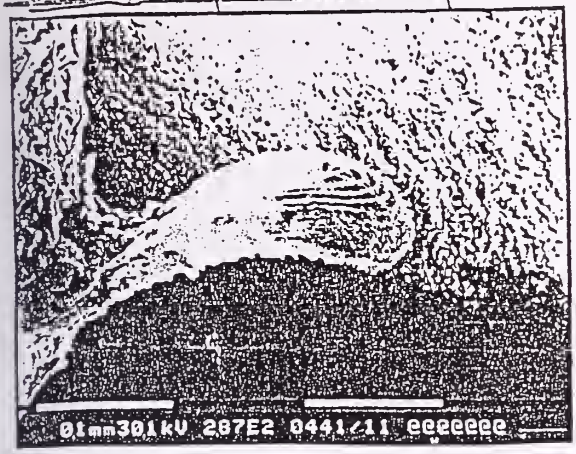




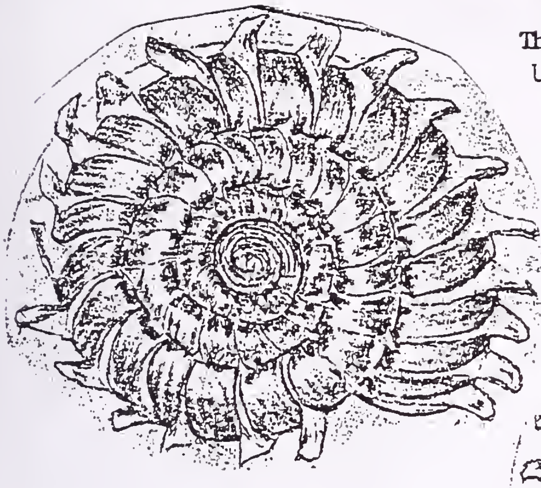
Therasiella tamora
Port Jackson, Coromandel
3x 2 mm.



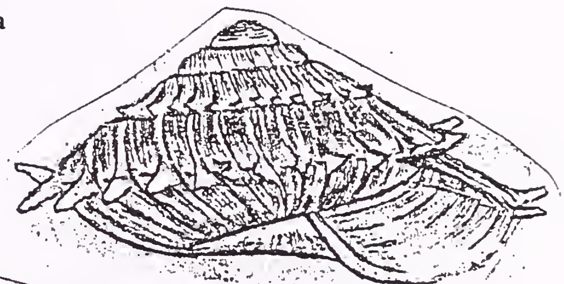
f tamora n.sp. North Cape

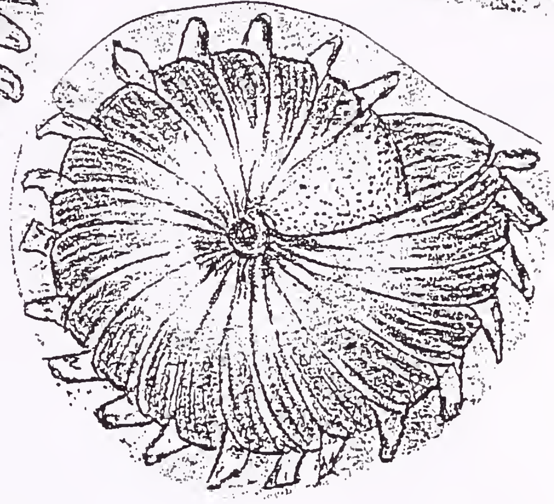


Therasiella cf tamora is essentially a smaller shell and the plates and processes not so well developed.



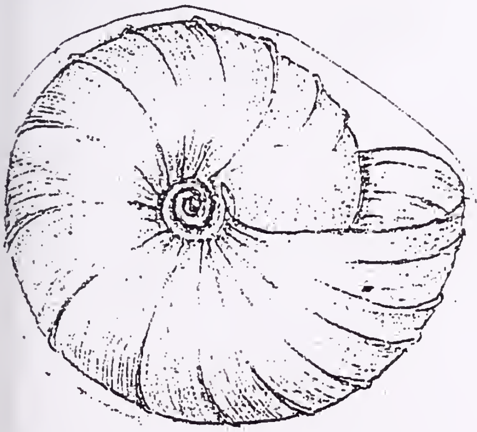
Therasiella cf tamora
Unawhao, North Cape
3 x 1.7 mm.

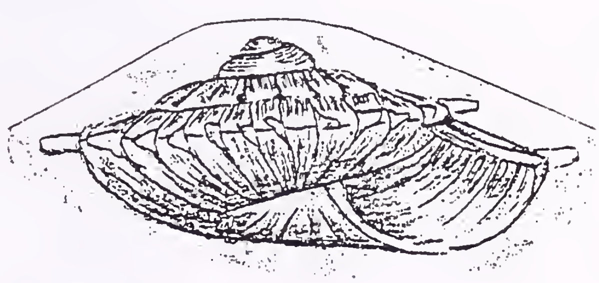


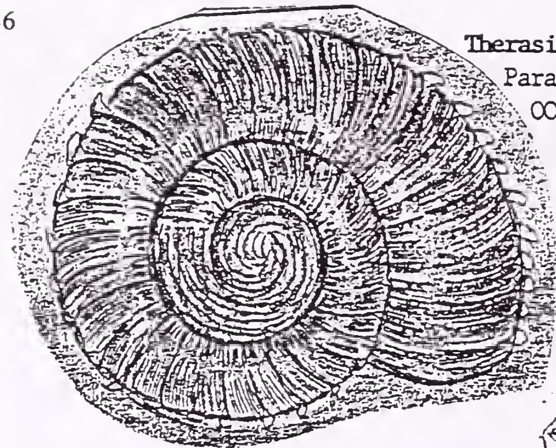


Therasiella cf tamora Pandora M02 894 492 coll. P.M.
This one had a larger umbilicus and sparser ribbing than the average one drawn above. 16 on the body whorl as opposed to 22.

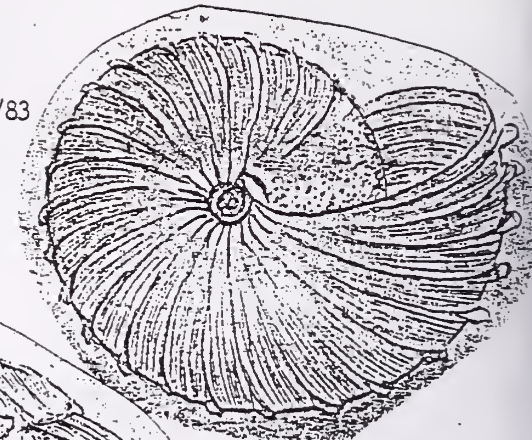
Therasiella cf tamora Taputaputa
2.4 x 1.2 mm All the specimens here were very much flatter.

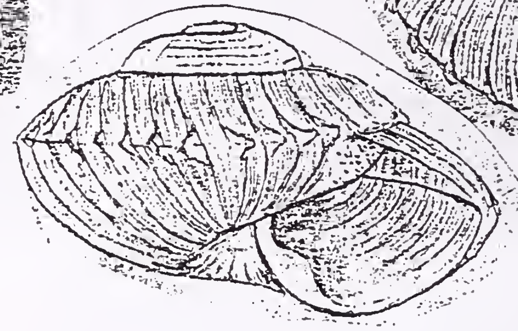






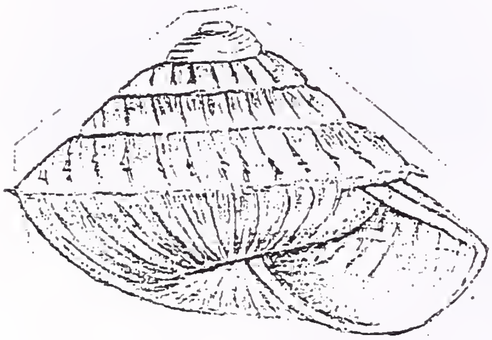
Therasiella cf elevata
Paranui Sceic Reserve
004 513 814 coll. P.M. 4/83
1.3 x 0.7 mm.

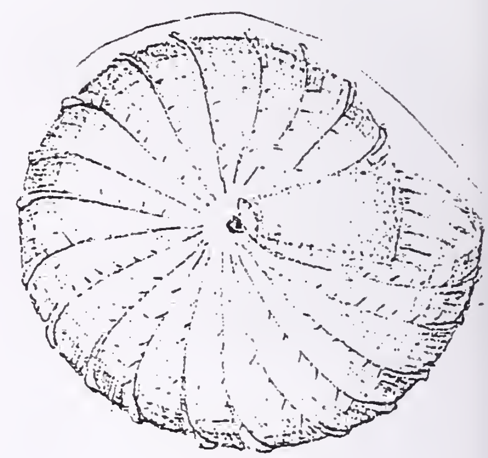




Therasiella cf elevata Mangamuka, Soda Springs Track 005 524 678 coll. P.M. 10/78

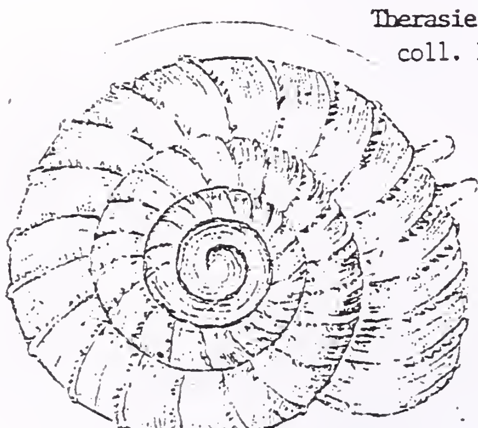
2.7 x 1.9 mm.

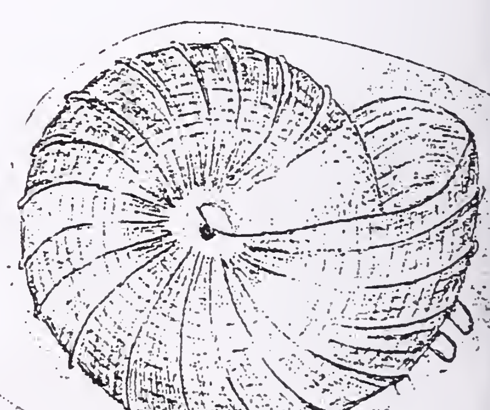


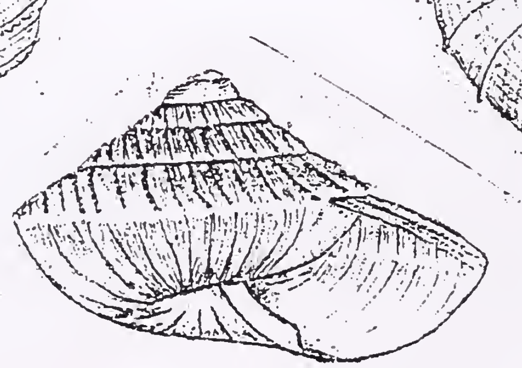


Therasiella cf elevata Herekino, Larmers Rd. 004 356 715
coll. P.M. 10/78

2.3 x 1.4 mm.

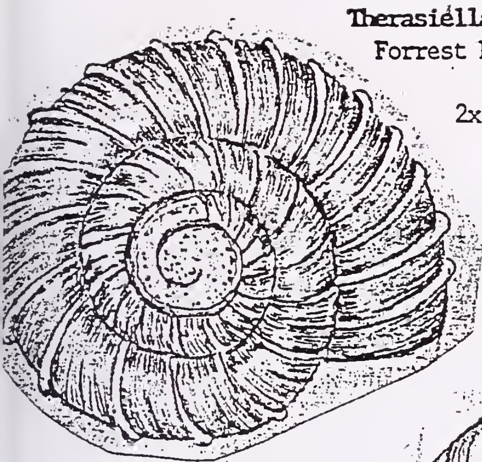


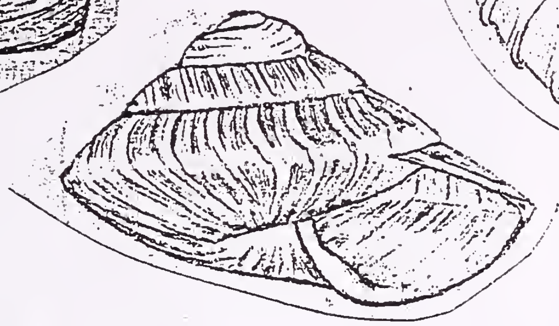


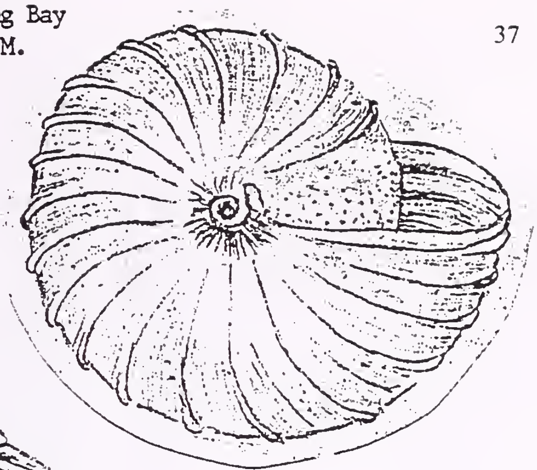


Therasiella cf elevata Tom Bowling Bay
Forrest Rd. M02 073 519 coll. P.M.

2x 1.4 mm.

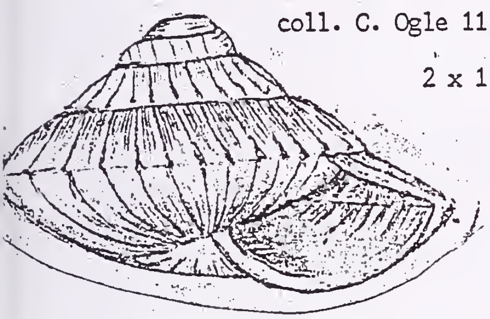


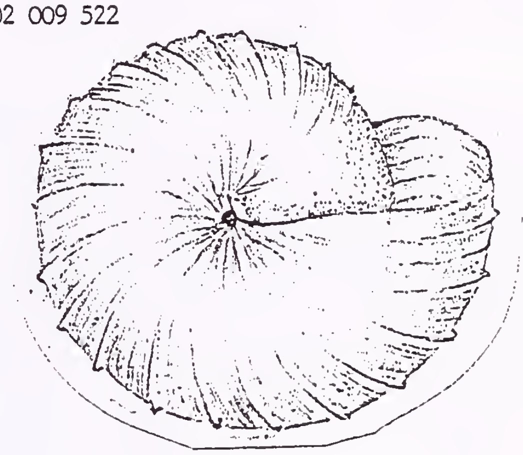




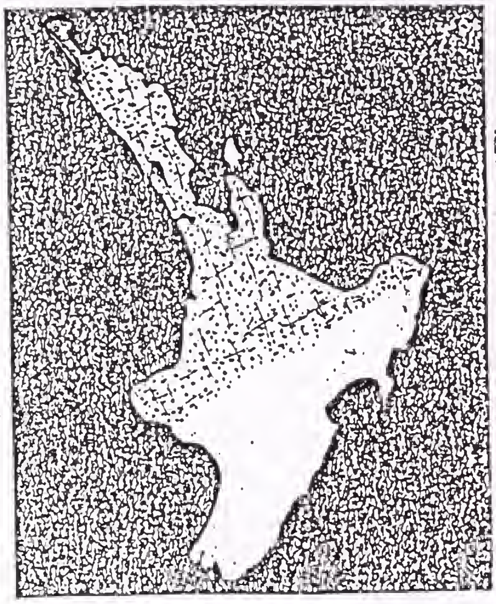
Therasiella cf elevata Unawhao 305 m. M02 009 522
coll. C. Ogle 11/86 N.M.N.Z..87743

2 x 1.5 mm.

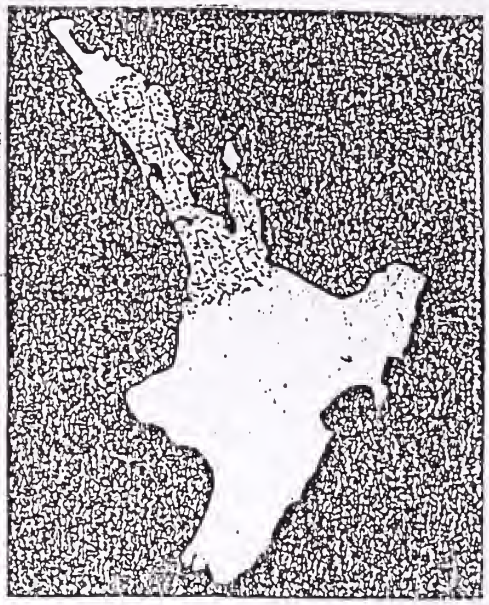




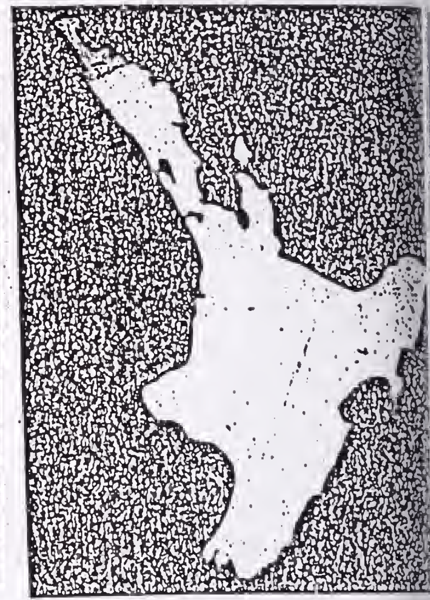
Therasiella celinde



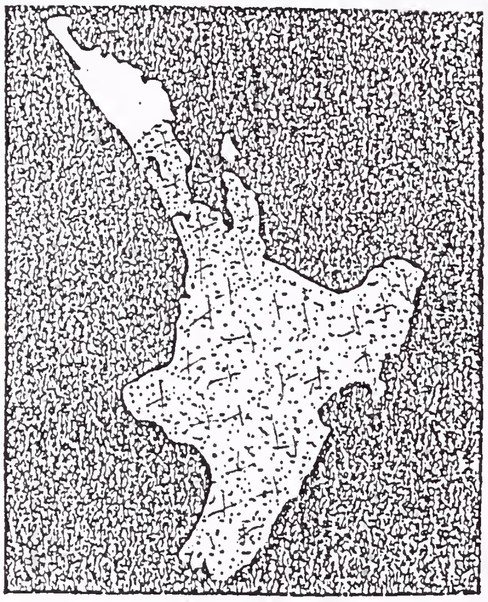
Therasiella tamora



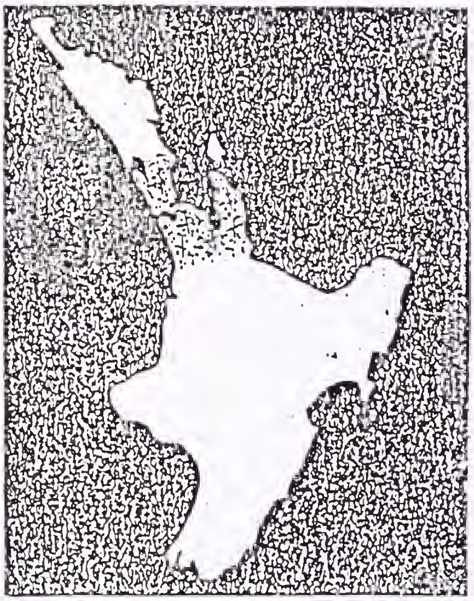
Therasiella cf tamora



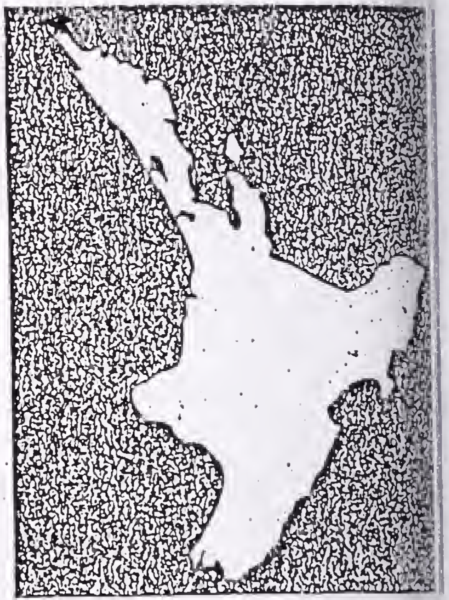
Therasiella neozelanica



Therasiella cf neozelanica



Therasiella n.sp. North Cape



Therasiella serrata

Therasiella elevata

Therasiella cf elevata

J.F.Goulstone – Bibliography.
Jim wrote many papers on landsnails, mostly beautifully illustrated with his own line drawings, starting in 1968 and ongoing until his death. Only in recent years have many of them been published but most of the earlier ones have been saved in a bound volume stored in the Auckland Museum Library (AMI Library) Jim also wrote regular pieces for the Conchology Section of the Auckland Museum 's magazine "Poirieria"

Goulstone, J.F.

1968 Some Phrixgnathus from about Auckland **Poirieria** Vol 4:4. 66-70
1969 Some Very Small Landsnails **Poirieria** Vol 4:6. 95-98
1969 A Little Light on Latin **Poirieria** Vol 5:1. 14-16
1974 A Short trip to Masons Bay **Poirieria** Vol 7:3. 61-65
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1977 Native Landsnails from the Hunua Range and several locations in South Auckland. In **Goulstone et.al.** AMI Library.
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1996 Surprise at Government House, Auckland **Poirieria** Vol 19. 29
1996 Seven new species of Climocella n. gen. (Punctoidea: Chiropidae) from Northern New Zealand **Records of the Auckland Institute and Museum** 33 173-194
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1995 Landsnails Past and Present at Mimiwhangata **Poirieria** Vol.`17. 7
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1997 The Last Word on Mission Bay Sand

Morley, Margaret S., Goulstone Jim and Gladys, et al.
1998 Mollusc Survey Beachlands and Motukaraka Island

Requiem.

They told me Jim, my friend, they told me you were dead;
They brought me such sad news to hear, and swollen tears to shed.
I wept as I remembered how often you and I
Had tired the sun with talking, and seen it from the sky.
But now my wonderful colleague, the best among the best,
A handful of grey ashes, now finally laid to rest.
Your voice still echoes on just as the snails at night awake
For death may take all far away, but you it cannot take.

Mike.

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Auckland Museum

Conchology Section

Volume 26 October, 2000

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JUST JUVENILES

by Margaret S. Morley

SUMMARY
Juvenile and adult specimens of *Scutus breviculus, Monodilepas diememensis, Cookia sulcata, Astraea heliotropium, Struthiolaria papulosa, Turbo smaragdus* and *Murexul octogonus* are discussed and illustrated.

INTRODUCTION
In most well documented gastropod molluscs there is a description of the protoconch, but sometimes it is not mentioned. The protoconch frequently has a different sculpture or form to the adult whorls. It is sometimes used to confirm an identification. For example in the family Pyramidellidae the protoconch is sinistral, that is it spirals in the opposite direction to the adult whorls (Fig. 1). It is also set at an angle to the adult whorls and partly immersed i.e. covered by the following whorl (Powell 1979). Bruce Marshall (1995) revised the recent *Calliostoma* species of New Zealand. Photographs of the early teleconch with the scanning electron microscope, enabled him to separate species with similar adult sculpture.

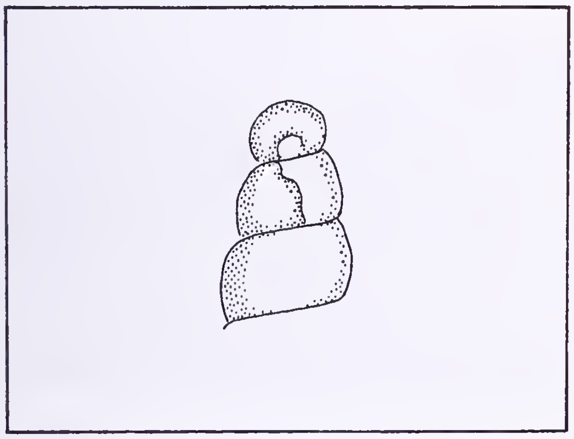
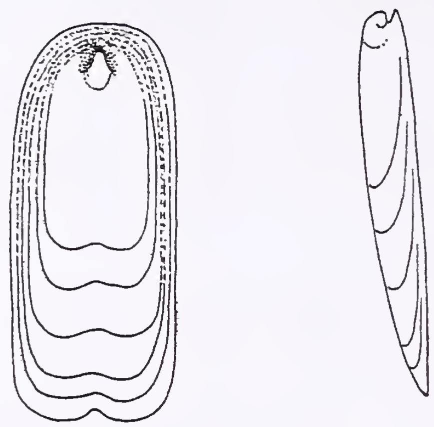


Fig. 1 Pyramidellidae Protoconch
***Odostomia incidata* Suter, 1908 Height 0.3mm.**

Earlier articles in Poirieria describing the protoconch and developmental stages of other molluscs include Calyptraeidae, Ranellidae, *Rissoina manawhatawhia, Zelippistes benhami, Hiatella arctica* and *Siphonaria propria* (Morley 1986, 1995, 1996a, 1998).

Unless stated otherwise all specimens referred to in the article were collected by and are in the author's collection. Names are updated to Spencer & Willan (1996) except for *Scutus breviculus* which has been reinstated by Bruce Marshall (1998).

Fissurellidae *Scutus breviculus* Blainville, 1817
The juvenile specimen (Fig. 2), length 8mm, width 3mm was found under rocks in Tutukaka Harbour, Northland on 20 December 1987 during a snorkel. The profile view gives a hint of the spiral nature of the protoconch although this is lost in the adult shell (Fig. 3). The mature *S. breviculus* was found at low tide, deep in rocky crevices at Oneroa, Waiheke Island, Hauraki Gulf on 24 April 1984, length 54mm, width 29mm.



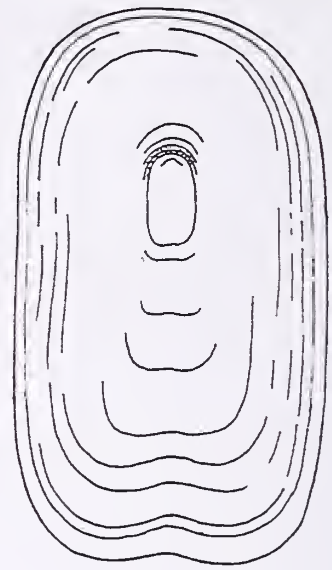
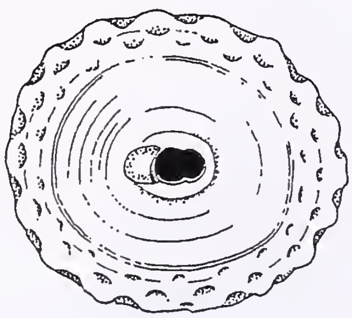


Fig. 2 Juvenile *Scutus breviculus* Blainville, 1817 Length 8mm.

Fig. 3 Adult *Scutus breviculus* Blainville, 1817 Length 54mm.

Fissurellidae *Monodilepas diemenensis* Finlay, 1930

In gastropods it is logical to expect that the protoconch, unless eroded off, will be at the tip of the spire. However, when the apex is a hole, as in *Monodilepas diemenensis* what happened to the protoconch? The juvenile specimen, length 1.4mm (Figs. 4a,b) supplies the answer. I had two similar specimens but one shed its protoconch while being moved for drawing. It was very fragile and only weakly attached. The specimens were found in shell sand in 90m taken by Kevin Burch during a dive at Nye Nye Arch at the Poor Knights Islands in 1979. The locations for this species are off the Three Kings Islands in 92m and 260m, Cape Maria van Diemen and Whangaroa (Powell 1979). These juvenile specimens extend the published range south of Whangaroa.



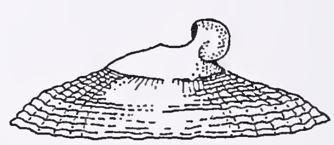


Fig. 4a Dorsal view Juvenile *Monodilepas diemenensis* Finlay, 1930 Length 1.4mm.

Fig. 4b Lateral view

In mature specimens of *Monodilepas diemenensis*. (Fig. 5) the protoconch is eroded off. This specimen, length 12mm, width 9mm was washed up on Te Werahi, Cape Reinga, Northland on 2 January 1973.

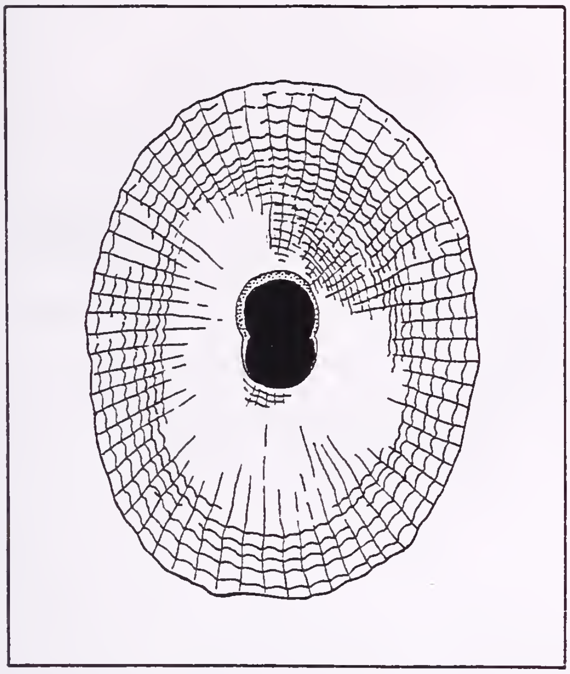


Fig. 5 Adult *Monodilepas diemenensis* Finlay, 1930 Length 12mm.

Turbinidae *Cookia sulcata* (Gmelin, 1791)

The first juvenile *C. sulcata* (Fig. 6) in my collection was found in shell sand at Brampton Reef, Bay of Islands on 14 October 1997, height 6.2mm, width 9mm. I was deceived by the prominent bevelled keel and labelled it *Astraea heliotropium*. At a later date with more specimens for comparision the misidentification was evident. However none of the specimens I have seen have a complete protoconch and early whorls are covered with white and pink calcareous algae.

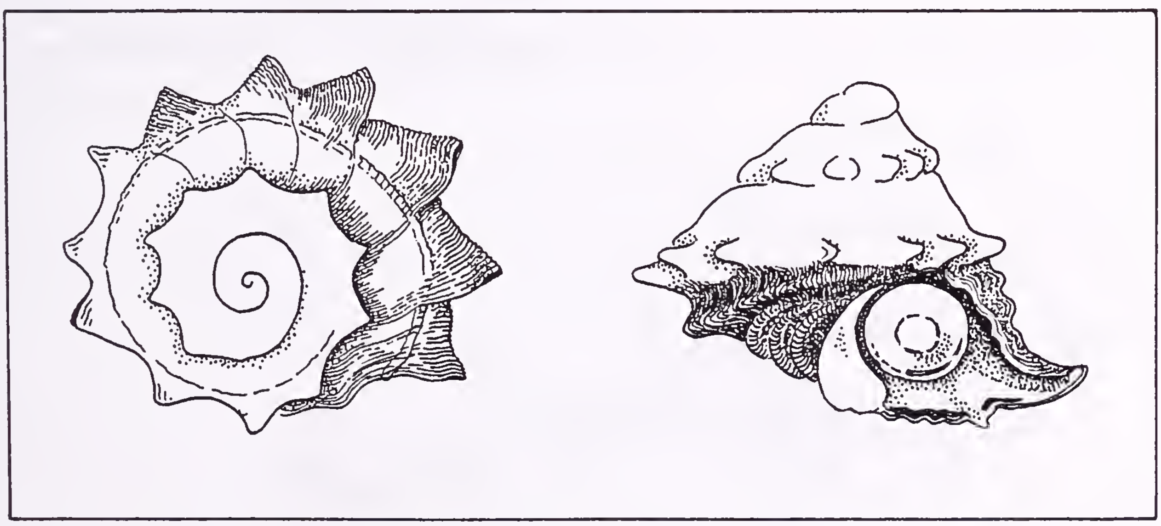


Fig. 6 Juvenile *Cookia sulcata* (Gmelin, 1791) Height 6.2mm.

The adult *C. sulcata* (Fig. 7) came from low tidal rocks at Smugglers Cove, Whangarei Heads, during a snorkel on 6 December 1991, height 65mm, width 72mm.

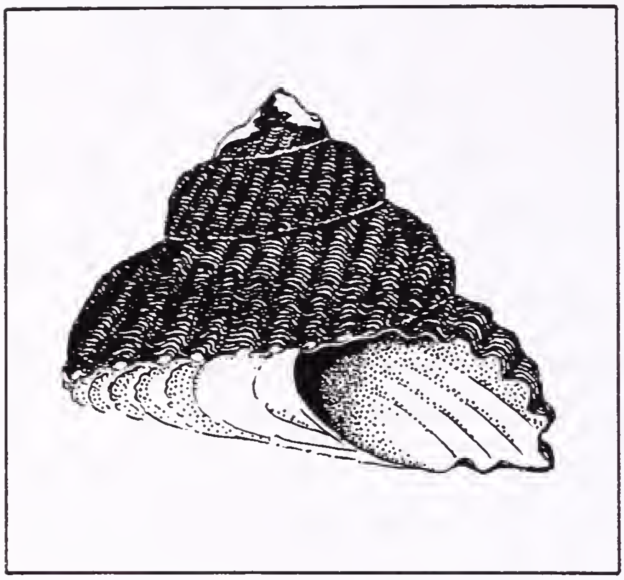


Fig. 7 Adult *Cookia sulcata* (Gmelin, 1791) Height 65mm.

Turbinidae *Astraea heliotropium* (Martyn, 1784)
On 12 September 1996, I found a genuine juvenile of *Astraea heliotropium* (Fig. 8) at Mission Bay, Auckland in sand dredged 4 km off Pakiri, east coast Northland, in a depth of 40m (Morley 1996), height 4mm, width 12.8mm. When juveniles of *C. sulcata* and *A. heliotropium* are compared the latter has more conspicuous spiny processes, is widely umbilicated and has a shorter spire with a flattened apex.

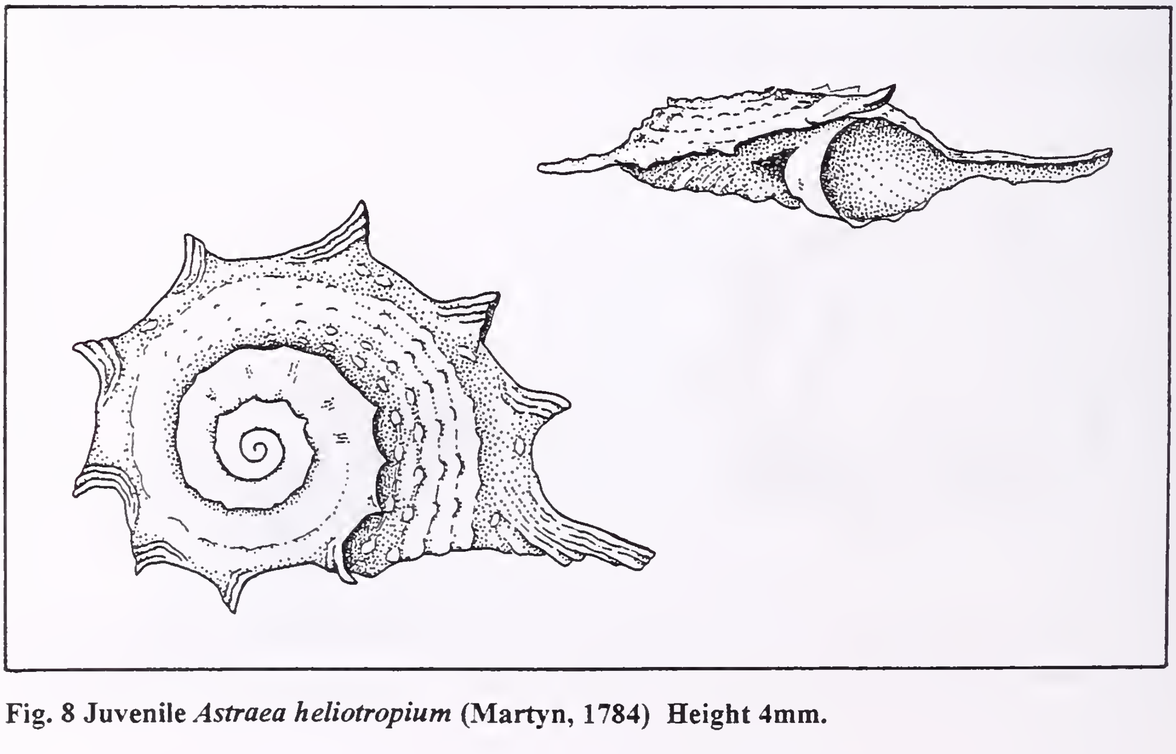


Fig. 8 Juvenile *Astraea heliotropium* (Martyn, 1784) Height 4mm.

The adult specimen of *A. heliotropium* (Fig. 9) was dredged off Northland in 1960, height 64mm, width 110mm. The maximum width for this species is 120mm living in depths from 2-120m (Powell 1979).

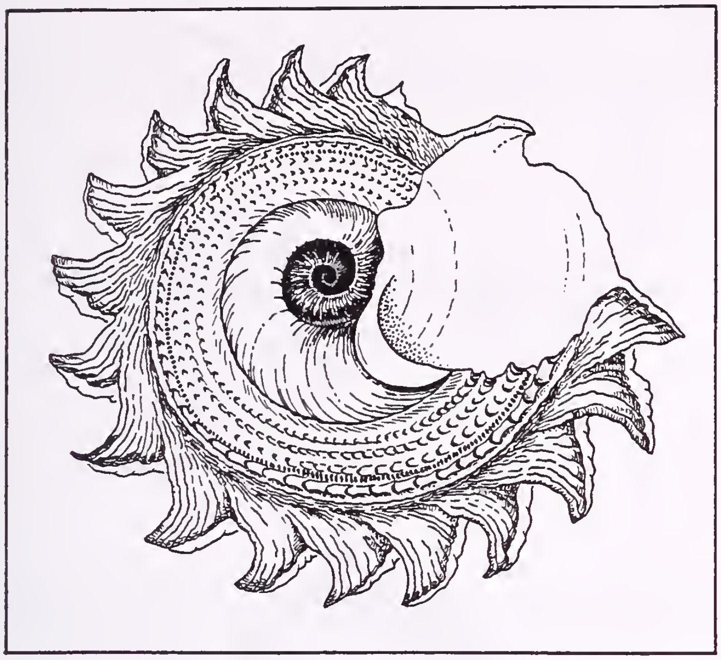


Fig. 9 Adult *Astraea heliotropium* (Martyn, 1784) Height 64mm.

Turbinidae *Turbo smaragdus* Gmelin, 1791

In a few gastropods both the early whorls and the protoconch have a different form to the adult. This has sometimes resulted in differing opinions by malacologists (Powell 1979 p.249).

In 1908, Suter (1913) described a new species *Zerotula bicarinata* (as *Omalogrya bicarinata*) taken in 90m off the Snares Islands, Subantarctic. The type has been shown to be a juvenile *T. smaragdus* (Iredale 1915). He says the periostome is continuous which is quite antagonistic to the genus of *Omalogrya* and that it does not have features of a mature shell. The earliest stage of *T. smaragdus* is bicarinate (Fig. 10a). The figured specimen came from Kakamatua, Manukau Harbour, on 10 September 1999, height 0.6mm, width 1.2mm. During growth the shell rapidly develops a third spiral whorl becoming tricarinate (Fig. 10b).

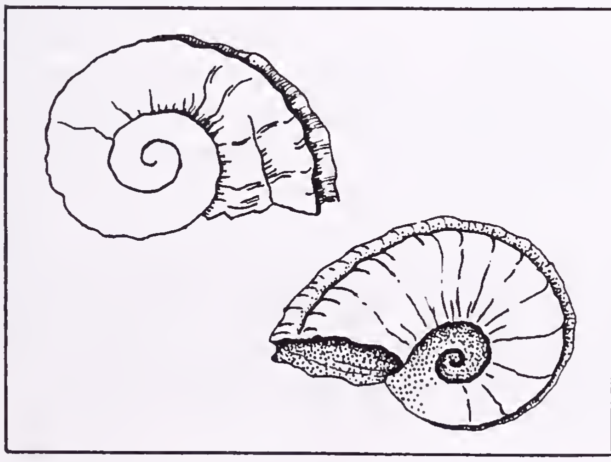


Fig. 10a Juvenile *Turbo smaragdus* Gmelin, 1791 Height 0.6mm.

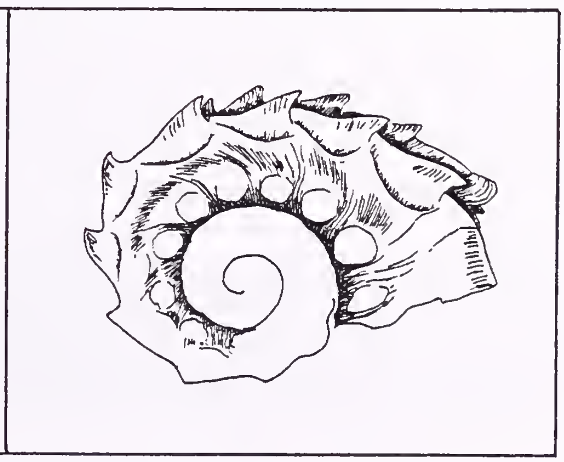


Fig. 10b Juvenile *Turbo smaragdus*. (Gmelin, 1791) Height 4mm.

In sub-adult specimens of *T. smaragdus* there are strong spiral ridges (Fig. 11). The figured specimen came from low tidal rocks, in Herekino Harbour entrance, west Northland on 22 November 1994, height 18mm, width 20mm.

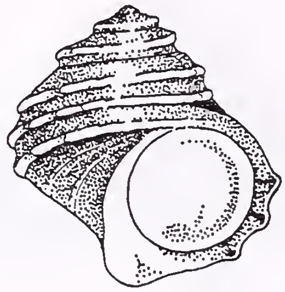


Fig. 11 Ridged *Turbo smaragdus* Gmelin, 1791
Height 18mm.

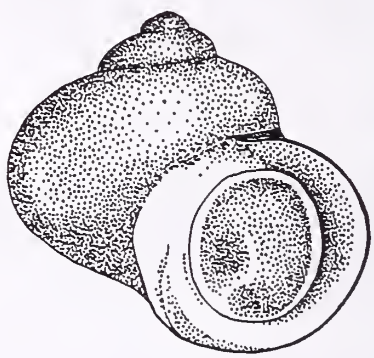


Fig. 12 Mature *Turbo smaragdus*
Height 64mm.

Specimens in the Waitemata and other east coast beaches of the North Island retain the ridges on the early whorls but the penultimate and the body whorls are usually smooth (Fig. 12). This specimen was found at Taupiri, east coast Northland on 22 January 1981, height 46mm, width 49mm. In most mature specimens on the west coast of Northland and Auckland the ridges tend to persist on all whorls, only fading on the body whorl. Ridges also persist on adult shells that I have seen from around Wellington and the South and Stewart Islands. Can anyone else comment on specimens in their collections, especially from the South Island?

T. smaragdus is generally thought of as a low tidal or below tide species, however it can extend up to high tidal level on semi-exposed beaches where there is shade from overhanging cliffs or trees. In these habitats the shells are tan rather than black. *T. smaragdus* is commonly found at high tidal level on the west coast beaches of Great Barrier Island, Hauraki Gulf.

Struthiolariidae *Struthiolaria papulosa* (Martyn, 1784), *S. (Pelicaria) vermis* (Martyn, 1784)

In 1985, when I first found bulbous frail juveniles less than 4mm in height (Figs. 13, 14) in shell sand at Oneroa, Waiheke Island, I thought they were small *Tonna*. On reflection their true identification of *Struthiolaria* made more sense as they were common, could not have travelled far and I have never found any trace of adult *Tonna* on Oneroa.

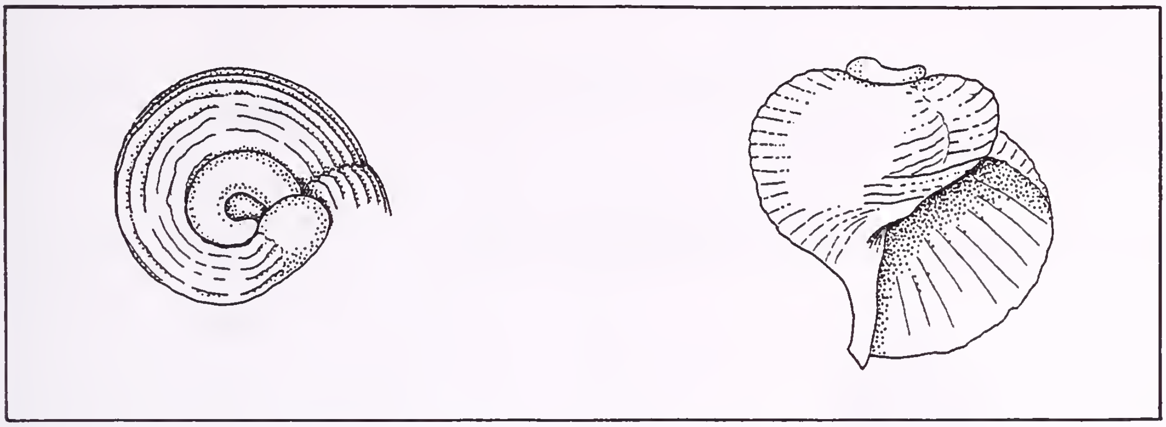


Fig. 13 Protoconch and early whorls *Struthiolaria papulosa* (Martyn, 1784) Height 2.0mm.

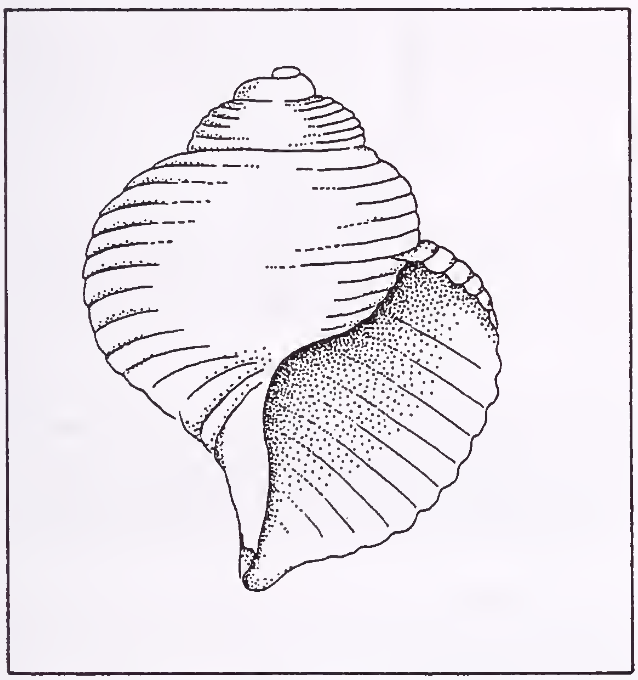


Fig. 14 Juvenile *Struthiolaria papulosa* (Martyn, 1784) Height 4mm.

The protoconch of *S. papulosa* is small of several whorls, the first planobid and smooth, the remainder convex and spirally grooved; the protoconch of *S. (P.) vermis* is rather large, paucispiral, smooth and cap-shaped (Powell 1979). The small multispiral protoconch of *S. papulosa* indicates that there is a veliger stage in the plankton. In the adult stages, the tip of the teleconch is calcareously sealed and protoconch falls off (John Morton pers. comm.). Most of the juvenile specimens in my collection have a small smooth protoconch but the demarcation between the protoconch and the first adult whorl is not always clear.

The large protoconch of *S. (P.) vermis* is necessary to contain the big yolky egg. The larva does not have a free swimming stage but is a direct developer from the egg. Sometimes in a well preserved specimen the large protoconch is still present (John Morton pers. comm.).

When diving in about 10m of water at Smugglers Bay, Whangarei Heads, Derrick Crosby (1990) collected a live specimen of *S. (P.) vermis,* with a height of 48mm. When removing the animal he found in the mantle cavity about 10 juvenile specimens each measuring 3mm.

The adult specimen of *S. papulosa* (Fig. 15) was washed in alive at Oneroa on 12 August 1978, height 86mm, width 48mm.

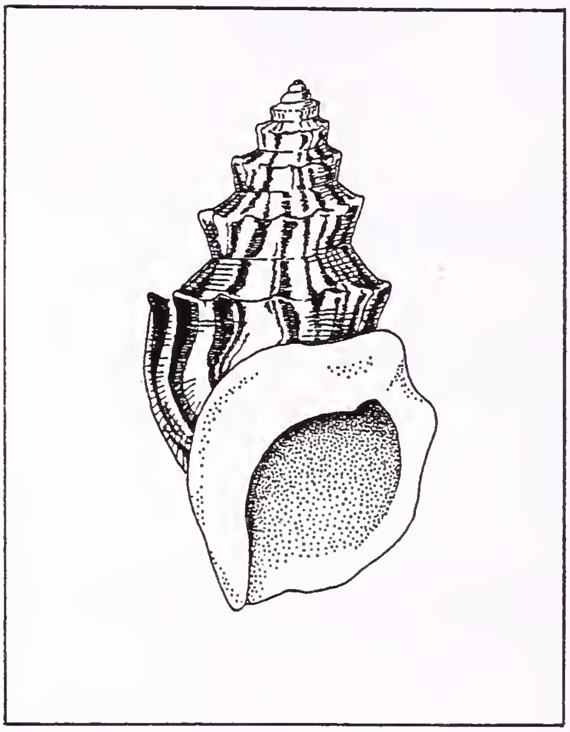


Fig. 15 Adult *Struthiolaria papulosa* (Martyn, 1784) Height 86mm.

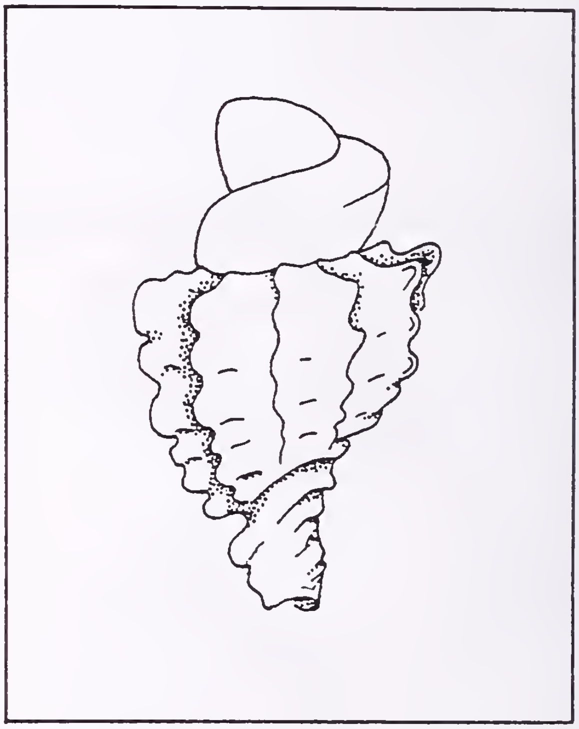


Fig. 16 Juvenile *Murexul octogonus* (Quoy and Gaimard, 1833) Height 1.6mm.

Muricidae *Murexul octogonus* (Quoy & Gaimard, 1833)

Even if the protoconch is included in the description a juvenile shell can be easily misidentified. In 1983, the first juvenile specimen of *Murexul octogonus* (Fig. 16) in my collection came from the Poor Knights Islands on 1 May 1978, height 1.6mm, width 2.5mm. I labelled this as *Comptella coronata*, an uncommon microscopic shell from deep water. Not surprisingly, it did not have all the features in the description, for example no spirals on the protoconch. The locations for this species are off the Chathams Islands, South and Stewart Islands (Powell 1979) while my specimen came from the Poor Knights Islands! I think it was Steve O'Shea who disillusioned me with its correct identification.

A second similar juvenile was dredged in 27m off Tiritiri Matangi, Hauraki Gulf by Steve O'Shea on 23 June 1992. It has been identified by Bruce Marshall as *Murexul octogonus*. Since then I have collected a growth series of sub-adult specimens. The protoconch of a fully mature specimen is usually eroded off. The adult specimen (Fig. 17) was dredged at the same location as the juvenile and has a height of 32mm and a width of 16mm.

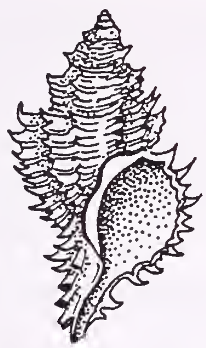


Fig.17 Adult *Murexul octogonus* (Quoy and Gaimard, 1833) Height 32mm.

Beu & Maxwell (1990) say that the living intertidal species *M. mariae* is similar to the fossil species *M. espinosus* but has a smaller protoconch. Their relationship needs further study.

ENDNOTE

Several other "just juveniles" in my collection may warrent a sequel to this article. If you have any specimens of other species that show development from the protoconch to the mature shell I would be interested to see them with a view to possible inclusion.

ACKNOWLEDGEMENTS

Thanks to Steve O'Shea for collecing some of the specimens and helping with identifications, Bruce Marshall for identifying the *Murexul octogonus*, John Morton for details of *Struthiolaria* reproduction and Bruce Hayward for suggesting improvements to the manuscript.

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The Kauri Snail Returns to Trounson Kauri Park

by Jenny and Tony Enderby

Trounson Kauri Park was set aside as a reserve by the Government in 1890 when logging threatened to completely wipe out all of the Northland kauri forests. An early settler in the area, James Trounson, donated 22 hectares of land to the original park making a total of 25.34 hectares. A further 364 hectares was later added and in 1921 the area became officially known as Trounson Kauri Park and was opened by the Governor General.

Over the years since then, introduced predators such as rats, possums and stoats invaded Northland and decimated the bird life, the insects and the kauri snails. On previous visits to the park we walked at night through the area hoping to see or hear some of the rapidly vanishing wildlife. Sadly by the late 1980s it was all but gone.

In 1995 the Department of Conservation began a project to turn the park into a mainland island. This meant ridding the park of the introduced predators such as rats, stoats, weasels, possums and wild cats.

A major trapping and poison bait station programme was set in place. The local community was also invited to become involved to ensure that domestic cats did not replace the wild ones in the role of predator.

The forest area is surrounded by a large open area of farmland which could be likened to a medieval moat. Incoming predators must cross this open area to gain access to the park. There is now an ongoing check on native species in the park and nightly spotlight vigils of the surrounding area to ensure that predators do not re-establish.

We visited the park earlier this year and were able to do a night walk. One of the highlights was to see a large kauri snail crawling across the gravel walkway only a few hundred metres into the bush. We were told that the snails had re-established in large numbers, now that the rats had gone. During the walk we saw two other *Paryphanta busbyi busbyi* crawling on the walkway.

Visitors are no longer permitted free access to the area at night, but guided walks are available from the local camping ground most nights. The cost is a very reasonable $15 per person and includes transport to and from the reserve and a good two hour walk. Our guide was very knowledgeable about everything to do with the park and was very proud to be involved in the preservation of the area.

We had hoped to see or hear some kiwis but were not that lucky. However wetas, both cave and tree were present plus glow worms and a large fresh water kopuku in one of the streams.

We also walked the bush trail during the day and the bird noise was just magic. The park is now home to tui, kukupa or native pigeon, north island robin, kokako as well as kiwi and native bats.

The bush itself is undergoing major regeneration now that the rats and possums have gone. Many of the native fruiting plants such as kohekohe, pigeonwood, taire and podocarp species now provide an ongoing food source for the birds. Seeds which fall to the forest floor now sprout and grow rather than being eaten.

The park is the first example of a mainland island. It has shown what can be done to re-establish species which have vanished from areas on the mainland. There are other areas around New Zealand which could become mainland islands also.

Scientific Paper Summaries

by Peter Poortman

This article contains brief summaries of a selection of scientific papers that have been published in recent years. Copies of the original publications are held in the club library, or can be obtained from the author of the paper.

NB: In scientific papers, there is significance in the presence or absence of parentheses around the name and date of a species author. I.e. no parentheses mean that the species is in the genus it was originally named in, whereas parentheses mean that the species was originally named in a different genus.

Title: **Recent and Tertiary Trochaclididae from the Southwest Pacific (Mollusca: Gastropoda: Trochoidea)**

Author: Bruce A. Marshall
(The Veliger 38(2):92-115, April 3, 1995)

This paper records twenty-three species (including fifteen new species) of the Trochaclididae, seventeen from New Zealand, five from Australia, and one from New Caledonia. Two new genera, *Acremodontina* and *Austrotrochaclis* are also recorded.

The Trochaclididae are a group of deep water marine gastropods with small (up to 9mm) turbiniform shells. The New Zealand representatives are recorded as follows:

Trochaclis bucina (Laws, 1941) – early Miocene (Otaian), Pakaurangi Point, Kaipara Harbour.
Trochaclis atypica (Laws, 1939) – early Miocene (Otaian), Pakaurangi Point, Kaipara Harbour.
Trochaclis kaiparica Marshall, new species – early Miocene (Otaian), Pakaurangi Point, Kaipara Harbour.
Trochaclis calva Marshall, new species – off Three Kings Islands, 805m.
Trochaclis regalis Marshall, new species – off Three Kings Islands, 310-710m.
Trochaclis elata Marshall, new species – off Three Kings Islands, 310-805m.
Trochaclis attenuata Marshall, new species – off Three Kings Islands, 440m.
Trochaclis cristata Marshall, new species – off Three Kings Islands, 710m.
Acremodontina maxwelli Marshall, new species – early Miocene (Otaian), Pakaurangi Point, Kaipara Hbr.
Acremodontina carinata (Powell, 1940) – off Three Kings Islands and north-eastern NZ, 27-805m.
Acremodontina varicosa Marshall, new species – early Pliocene (Waipipian), Pitt Island, Chatham Islands, and Recent off Three Kings Islands, 192-805m.
Acremodontina kermadecensis Marshall, new species – off Raoul Island, Kermadec Islands, 165-220m.
Acremodontina atypica (Powell, 1937) – off Three Kings Islands, 91-622m.
Acremodontina magna Marshall, new species – off Three Kings Islands, 805m.
Acremodontina simplex (Powell, 1937) – off Three Kings Islands and north-eastern NZ, 78-805m.
Acremodontina poutama (E.C.Smith, 1962) – South Westland, Stewart Island, and Snares Islands, 55-183m.
Acremodonta crassicosta (Powell, 1937) – off Three Kings Islands, 102-805m.

Title: **A Revision of the Recent *Calliostoma* Species of New Zealand (Mollusca: Gastropoda: Trochoidea)**

Author: Bruce A. Marshall
(The Nautilis 108(4):83-127, 1995)

The family Calliostomatidae comprises about 250 living species worldwide. They occur in all oceans from the intertidal zone to about 3000 meters depth, mostly on rocky ground. All known species are carnivores, most feeding on cnidaria, and sometimes carion, although a few feed exclusively on sponges.

Thirty-three Recent calliostomatid species are recorded from New Zealand. This paper describes twenty-six of these species, ten of which are new. Of the remaining seven species, five are recorded in the subfamily THYSANODONTINAE (see Marshall, 1988), and two are described as type species of new genera in a paper published by Bruce Marshall later in 1995, entitled:

Calliostomatidae (Gastropoda: Trochoidea) from New Caledonia, the Loyalty Islands, and the northern Lord Howe Rise.

This later paper names and describes the two new type species as *C. (Bathyfautor) rapuhia* and *C. (Fautrix) candida*, brief descriptions of which are included below. It also names and describes the new genus of *Selastele* for which *C. onustum* (Odhner, 1924) becomes the type species.

Calliostoma (Otukaia) blacki (Dell, 1956) is renamed to *C. (Otukaia) alertae*, and several previously recorded species are synonymized as indicated below. Five additional species are known from off the Kermadec Islands (see Marshall, 1979), and many more species are known from the New Zealand Cenozoic fossil record.

Attention is drawn to the fact that calliostomatid shell shape tends to become more variable with increasing size/age. This can result in species with dissimilar early teleoconchs being superficially similar at maturity and vice versa. For accurate identification of species an examination of the earliest teleoconch whorls is required. All such distinguishing shell features are described in detail in the published paper.

***Calliostoma (Otukaia) alertae* Marshall, new name**
(= replacement name for *C. (Otukaia) blacki* (Dell, 1956))
Off Cape Brett southward to off The Snares, Challenger Plateau, and Pukaki Rise, 280-861m. Shell iridescent and weakly nodular, up to 32mm high.

***Calliostoma (Maurea) antipodense* Marshall, new species**
Off Antipodes Islands, at 18-103m. Shell up to 37mm high, rather thin, glossy, and evenly conical. Colour orange buff, spiral cords reddish brown between paler nodules.

***Calliostoma (Maurea) aupourianum* Marshall, new species**
Off Three Kings Islands, Mayor Island, and East Cape, at 102-805m. Shell up to 8.6mm high, glossy, and of moderate thickness. Whorl colour yellowish or pale yellowish brown, with the spire irregularly axially mottled in a darker shade.

***Calliostoma (Maurea) benthicola* (Dell, 1950)**
Endemic to Mernoo Bank, western Chatham Rise, 75-129m. Shell up to 32mm high, very similar to *C. granti* but has weaker nodules and is white with broad, reddish brown bands on the spiral cords after the fifth teleoconch whorl.

***Calliostoma (Maurea) blacki* (Powell, 1950)**
(= *couperi* Vella, 1954. = *profunda* Dell, 1956)
Chatham Rise, South Island east coast from Kaikoura southwards, Stewart, Snares, Auckland, Campbell, and Bounty Islands, 73-549m. Shell up to 50mm high, variable, and easily confused with *C. foveauxanum* and *C. simulans*.

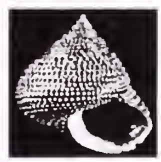
***Calliostoma (Fautrix) candida* Marshall, new species**
Off Three Kings Islands, 200-805m. Also off southern New Caledonia, 470-550m, and southern Norfolk Ridge, 356m. Shell up to 14.0mm high, glossy, thin, spire broadly conical, very narrowly umbilicate, translucent white.

***Calliostoma (Maurea) eminens* Marshall, new species**
Off Antipodes Islands, 13-123m, probably endemic. Shell up to 51mm high. Colour yellowish brown, spiral cords reddish brown, nodules white, basal spirals alternately spotted reddish brown and white.

***Calliostoma (Maurea) foveauxanum* (Dell, 1950)**
South-eastern South Island, Stewart Island, and The Snares, 73-549m. Shellup to 62mm high, similar to *C. spectabile* but more finely sculptured.

***Calliostoma (Maurea) gibbsorum* Marshall, new species**
Off Three Kings Islands, 33-805m. Probably endemic. Shell up to 28.5mm (est) high, higher than broad, sculptured with spiral cords, rounded nodules, and axial riblets. Colour yellowish to orange brown, nodules more lightly pigmented or white, spirals darker.

***Calliostoma (Maurea) granti* (Powell, 1931)**
(= *ampla* Powell, 1939. = *multigemmata* Powell, 1952)
North Island south of East Cape and Cape Egmont, and South, Stewart, Snares, Auckland, Campbell, and Chatham islands, living from low tide to 220m. Similar in appearance to *C. punctulatum*, and also with considerable variation in shell size (up to 50mm) and shape. Ranges from thick and darkly pigmented with few, strong, strongly nodular spiral cords on intertidal specimens to thin and lightly pigmented (or white), with finer and more numerous spiral cords on deeper water specimens.



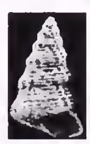
***Calliostoma (Maurea) jamiesoni* Marshall, new species**
Endemic to Three Kings Islands, 5-128m. Shell up to 33mm high, higher than broad, sculptured with spiral cords, rounded nodules, and axial riblets. Colour yellowish to orange brown, spiral cords reddish brown, nodules white or buff white.

***Calliostoma (sensu lato) kopua* Marshall, new species**
Off Cape Campbell and off East Otago, 424-600m. Shell up to 5.35mm high, slightly higher than broad, with minute umbilical chink. Iridescent nacreous through translucent outer shell layer.

***Calliostoma (sensu lato) limatulum* Marshall, new species**
Off Three Kings Islands and off Cape Reinga, 91-805m. Shell up to 6.6mm high, very similar to *C. onustum* but more broadly conical and with smooth spiral cords.

***Calliostoma (Maurea) maui* Marshall, new species**
Cook Strait, Chatham Rise, and off north-eastern South Island, 140-490m. Shell up to 44mm high, thin, glossy. Colour pale pinkish buff with yellowish or reddish brown spiral cords and predominantly white nodules.

***Calliostoma (Maurea) megaloprepes* (Tomlin, 1948)**
Off Macquarie Island, 79-113m, endemic. Similar to *C. blacki* but distinctive by its rich chestnut-brown coloration and reduced number of spiral cords



***Calliostoma (Selastele) onustum* (Odhner, 1924)**
Off Three Kings Islands and off Cape Reinga, 55-310m. Shell up to 6.6mm high, iridescent nacreous through translucent outer layer.

***Calliostoma (Maurea) osbornei* Powell, 1926**
Three Kings Islands southward to off Kapiti Island, 0-102m. Similar to *C. punctulatum and C. granti*, but more narrowly conical, especially in the north of it's range.

Calliostoma (Maurea) pellucidum (Valenciennes, 1846)
(= *undulatum* Finlay, 1923. = *spiratum* Oliver, 1926)
North, South, and Stewart Islands, 0-187m. Similar to *C. waikanae*, but distinctive in having reddish brown subsutural and peripheral maculations.

Calliostoma (Maurea) penniketi Marshall, new species
Three Kings Islands and Ranfurly Bank, East Cape, 55-622m. Shell up to 57mm high, rather thin but strong. Colour pale yellowish brown or buff white, sometimes rich yellowish brown on last whorl. Spiral cords spotted, and spire whorls typically maculated with yellowish or reddish brown.

Calliostoma (Maurea) punctulatum (Martyn, 1784)
North, South, and Stewart Islands, living intertidally to 274m. Common, but extremely variable in shape (narrowly to broadly conical), size (up to 51mm in height), thickness, colour (from dark reddish to pale yellowish brown), colour pattern, and sculpture (coarse to fine spiral cords).

Calliostoma (Bathyfautor) rapuhia Marshall, new species
Three Kings Rise, and southern Norfolk Ridge, 660-790m. Shell up to 22.8mm high, glossy, of moderate thickness, spire narrowly and evenly conical. Colour uniform buff white, pale green nacreous layer showing through translucent outer layer in spiral interspaces.

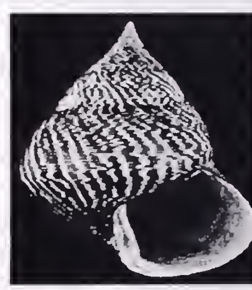
Calliostoma (Maurea) regale Marshall, new species
Off Three Kings Islands, 53-805m. Shell up to 13mm high, glossy, of moderate thickness. Similar to *C. osbornei* except in colour. First two whorls typically have a pinkish flush, elsewhere rather uniform pale buff white.

Calliostoma (Maurea) selectum (Dillwyn, 1817)
(= *hodgei* Hutton, 1875. = *ponderosus* Hutton, 1885. = *carnicolor* Preston, 1907)
North, South, Stewart and Chatham Islands, 0-293m on sand or mud with shell or stones. Shell diameter up to 70mm, low, angulate or narrowly rounded periphery.

Calliostoma (Maurea) simulans Marshall, 1994
Challenger Plateau, off New Plymouth, Cook Strait to SE of Banks Peninsula, Chatham Rise, and off Bounty and Campbell Islands, 183-1006m. Shell up to 52.5mm high, with strong spiral cords on the spire and convex, evenly expanding whorls.

Calliostoma (Maurea) spectabile (A. Adams, 1855)
Off Auckland and Campbell Islands, 0-146m. Large, heavy, strongly sculptured shell, up to 60mm high.

Calliostoma (Maurea) tigris (Gmelin, 1791)
(= *chathamensis* Dell, 1950)
Off Three Kings, North, South, Stewart, and Chatham Islands, at 0-211m. Large, up to 100mm high, but relatively thin shelled. Distinctively sculptured early teleoconch. Colour pattern of yellowish or reddish brown wavy axial bands.



Calliostoma (Maurea) turnerarum (Powell, 1964)
Three Kings Islands, off Ninety Mile Beach, and north-eastern North Island as far south as Cape Runaway, 186-805m. Similar to *C. waikanae* but with a more lightly built shell, finer sculpture, and in having pale wavy axial bands within which the strongest spiral cords are streaked deep reddish or yellowish brown.

Calliostoma (Maurea) waikanae Oliver, 1926
(= *morioria* Powell, 1946. = *forsteriana* Dell, 1950. = *haurakiensis* Dell, 1950)
Off North, South, Stewart, Snares and Chatham Islands, and Mernoo bank, 0-549m. Similar to *C. pellucidum* but more lightly pigmented with finer, more finely beaded spiral cords. Up to 52.5mm diameter.

Title: **A New Subfamily of the Addisoniidae Associated with Cephalopod Beaks from the Tropical Southwest Pacific, and a New Pseudococculinid Associated with Chondrichthyan Egg Cases from New Zealand (Mollusca: Lepetelloidea)**

Author: Bruce A. Marshall
(The Veliger 39(3):250-259, July 1, 1996)

This paper proposes a new subfamily (Helicopeltinae) of the Addisoniidae family, for a group of minute deep-sea gastropods found living and feeding on detrital cephalopod beaks from the Chesterfield Plateau and southern New Caledonia.

The opportunity is taken to describe a new limpet of the genus *Tentaoculus* (Moskalev, 1976), from New Zealand that lives and feeds within spent skate egg cases, the first record of a pseudococculinid from this habitat.

The egg cases of sharks and skates are composed primarily of layers of the structural protein collagen. How this tough, almost inert substance is metabolised is unknown, though it is possible that endosymbiotic bacteria are involved.

Tentaoculus balantiophaga **Marshall, new species**
Off Castlepoint, and western Chatham Rise, 1065-1335m.
Shell up to 3.25mm long, thin, translucent, white.

Title: **A luminescent eulimid (Mollusca: Gastropoda) from New Zealand**

Author: Bruce A. Marshall
(Molluscan Research, 18: 69-72. 1997)

This paper describes a new species of *Melanella* that emits a luminescent lime yellow glow from the last turn of the body. This is the first record of luminescence in a eulimid, and the first record of lime yellow luminescence in a gastropod (otherwise blue). Bioluminescence is rare in marine gastropods, and has been recorded only from some species of Planaxidae, a *Tonna* species, and a few nudibranchs. Precisely which part of the anatomy luminesces, the mode of light generation, the reason for luminescence, and the significance of lime yellow over blue light emission in this species remains to be determined.

Melanella luminosa **Marshall, new species**
Found at depths of 10-238m in the southern fiords of Southland and the Chatham Islands.
Shell up to 5.75mm high, perfectly smooth, translucent and colourless.
This species is parasitic on an abundant small red holothurian, and because of its luminescence is very easy to spot.

M. luminosa closely resembles *M. aucklandica* and *M. archeyi*, but differs mainly in size and outer lip profile. *M. archeyi* was treated as a synonym of *M. aucklandica* by Powell (1979), but is reenstated in this paper. All three species are widely distributed throughout southern New Zealand.

Title: **Marine Mollusca from Wellington Harbour & Approaches**

Author: Bruce A. Marshall

(Te Whanganui a Tara Wellington Harbour. Review of scientific & technical studies of Wellington Harbour, New Zealand, to 1997. Appendix 5.)

The document contains a list of 372 species that have been recorded from the Wellington Harbour. Each species is cross-referenced to general locations of: 1) the inner harbour, 2) the harbour narrows, and 3) the harbour approaches. In addition an indication is given of which species/locations have had live records since 1960.

The systematic order follows the Spencer & Willan 1996 checklist except that Bivalvia are grouped before Gastropoda, and the following name changes are introduced:

- *Atrina zelandica* (Gray, 1835) as a species rather than a subspecies of the Indo-west Pacific *A. pectinata* (Linnaeus, 1767).
- *Tiostrea chilinensis lutaria* (Hutton, 1873) as a species of *Ostrea* (Linnaeus, 1758) rather than a subspecies of the South American *Ostrea chilensis* (Philippi, 1845): i.e. as *Ostrea lutaria* Hutton, 1873.
- *Thracia vitrea* (Hutton, 1873) as a species distinct from *Hunkydora australica novozelandica* (Reeve, 1859).
- *Montfortula chathamensis* Finlay, 1928 as distinct from the Australian species *M. rugosa* (Quoy & Gaimard, 1834).
- *Scutus breviculus* (Blainville, 1817) as distinct from the Australian species *S. antipodes* (Montfort, 1810).
- *Herpetopoma larochei alacerrima* Dell, 1956 as a species rather than a subspecies of *H. larochei* (Powell, 1926): i.e. as *Herpetopoma alacerrima*
- *Diloma (Fractarmilla) bicanaliculata lenior* (Finlay, 1926) as a synonym of *D. (F.) bicanaliculata* (Dunker in Philippi, 1845).
- *Zeacolpus (Stiracolpus) delli* (Marwick, 1957) as a synonym of *Z. (S.) pagoda* (Reeve, 1849).
- *Buccinulum vittatum littorinoides* (Reeve, 1846) as a synonym of *B. vittatum* (Quoy & Gaimard, 1833).
- Interpretations of *Micrelenchus* and *Thoristella* species are based on revisions in press.

Special mention is also made of three particularly noteworthy species on the list:

- *Proneomenia quincarinata* Ponder, 1970 a primitive worm-like species known by only two specimens, one from off Island Bay, the other from the Chatham Islands.
- *Montfortula chathamensis* Finlay, 1928 a greenish limpet which is occasionally found on intertidal rocks at the harbour approaches and otherwise known only from Kaikoura and the Chatham Islands.
- *Smeagol climoi* Tillier & Ponder, 1992 a maggot-like mollusc which is only known from high-tidal gravel near Houghton Bay.

The only known introduced species listed is *Crassostrea gigas* (Thunberg, 1793), first recorded from Island Bay in 1991.

MOLLUSCS ON THE MENU

Michael K. Eagle

I have never understood why it is that people call molluscs shell-fish. They are not fish and some have no shell. All are soft-bodied, and their other name, mollusc, isn't even English; the name is derived from the Latin *mollis*, meaning soft. The calcareous shell serves as an exoskeleton, home, defense mechanism, and this well - adapted hard part preserves as a fossil. Fortunately fossil molluscs are never called shell-fish, probably because they are long dead, and cannot be eaten! Because of their abundance, characteristic variations in their shell, their adaptation to a wide variety of environments, and their long geologic history, shelled molluscs are among the most important fossils known.

Fig. 1. *Flemingostrea wollastoni* (Finlay) (from Beu *et al.* 1990).

Additionally, the remains of many molluscs (particularly oysters; e.g. *Flemingostrea wollastoni* (Fig. 1) are of considerable importance as rock builders (some limestones), and the remains of some molluscs enable the strata that they are preserved in to date that rock. Because molluscs are so abundant at all levels of the marine and freshwater spectrum, predation rates have always been enormous. Ever since the interaction of "Ediacrian" (pre - Cambrian) marine animals and early Palaeozoic faunas, survival of the fittest (and best adapted) has been a natural priority. Cambrian Rostroconchia (Fig. 2) are known to have been predated upon by trilobites. Rare Ordovician shells were preyed upon by straight - ammonoids such as the orthnocerids, and trilobites (that apparently reached their peak of development during this period). Palaeozoic shell - boring annelids commensulised or pathogenically parasitised molluscs, with the worm benefiting from the host's feeding current and protective shell. By Silurian times molluscs were represented by gastropods, bivalves, and cephalopods, but none of these were an important part of the fauna. Silurian and Devonian molluscs were eaten by trilobites, eurypterids, ammonites, fish (including sharks), and early sea-stars (Fig. 3). It was during the Devonian that molluscs began to develop and invade new environments. Cephalopods ("head -footed":- the mouth in the middle of the foot) are probably the most highly developed of all the molluscs. Devonian cephalopods were characterised by chamber sutures of rounded saddles and angular lobes, marking the first departure from the nautiloid-type suture.

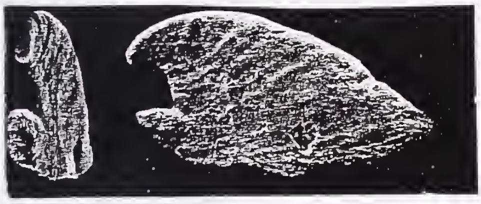


Fig. 2. New Zealand Cambrian Rostroconch *Anabarella simesi* MacKinnon (from MacKinnon 1985).

Although poorly represented in New Zealand, Carboniferous marine sequences elsewhere in the world indicate that many species of shark with flat, "pavement" teeth were well adapted for crushing mollusc shells. The great increase in these sharks may also account for the great reduction of trilobites at this time. Sea urchins may also have predated molluscs for the first time in the Carboniferous.

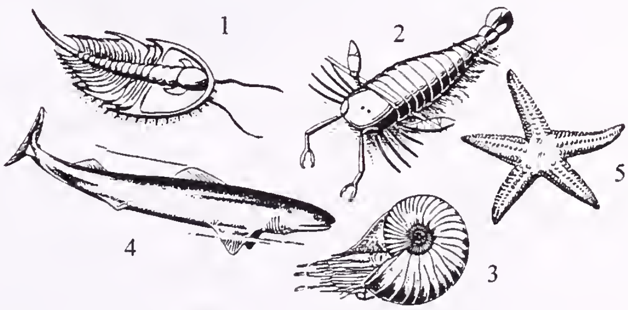


Fig. 3. Devonian mollusc predators: 1. trilobite; 2. eurypterid; 3. ammonite; 4. fish (shark); 5. seastar.

Permian molluscs continued to develop, and by the Mesozoic ("middle life") cephalopods, particularly the ammonites, were growing increasingly complex suture patterns.

Voracious Mesozoic marine reptiles such as Ichthyosaurs, plesiosaurs, mosasaurs (Fig. 4) are known to have included cephalopods on their menus. Teeth marks scour some ammonite and belemnite tests. New Zealand Mesozoic bivalves came under attack from increasing numbers of sea urchins (e.g. *Serpianotiaris* n. sp., *Dicyclocidaris denticulata*), and seastars (not starfish; they are no more "fish" than are molluscs!; e.g. *Cottreauaster* n. sp., *Odontaster priscus*). Molluscs continued to flourish and undergo unprecedented development. Oyster - like forms such as *Lopha* spp., and mussel - like forms such as *Buchia hochstetteri* (Fig. 5), arose during the New Zealand Jurassic. Cretaceous chamids and rudistids (Fig. 6) were attached reef-building forms elsewhere, whereas New Zealand *Magedicerus rangitera* (Fig. 7) was among the largest in the world (up to 1.25 m long),

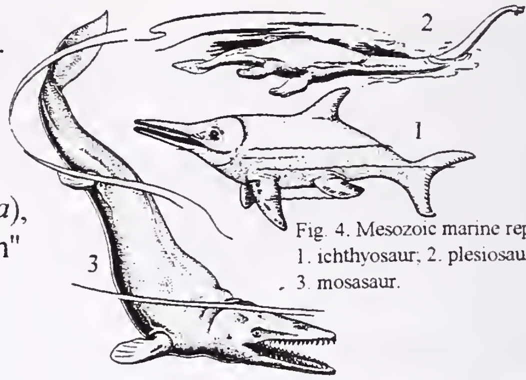


Fig. 4. Mesozoic marine reptiles: 1. ichthyosaur; 2. plesiosaur; 3. mosasaur.

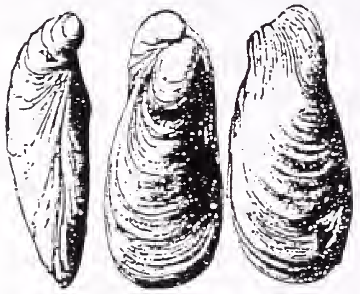


Fig. 5. *Buchia hochstetteri* Fleming from the Jurrassic of Port Waikato, South Auckland.

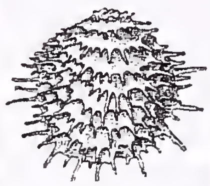


Fig. 6. *Chama calcarata* Lamarck

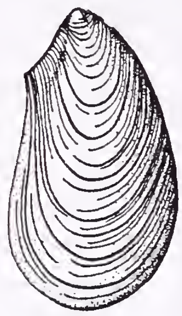


Fig. 7. *Magediceras rangitera* Wellman.

Fig. 8. Unusual molluscs: 1. *Radiolites*; 2. *Monopleura*; 3. *Toucasia* (from Matthews III 1962).

and unusual molluscs such as *Radiolites* (Fig. 8), *Monopleura,* and *Toucasia* radiated elsewhere. Mesozoic fishes, many with teeth adapted to crushing and grinding, such as primitive rays, dug feeding depressions in search of bivalves. Circumstantial evidence in the Mesozoic points to New Zealand having *Hesperornis* - like birds (Fig. 9), with small useless wings, long jaws bearing many "teeth", and strong feet suitable for paddling, feeding upon marine mollusca along the coastline of Gondwana. Pulmonate (air-breathing) snails continued their Mesozoic origins on Gondwana, being predated upon by land mammals, insects, and prehistoric birds

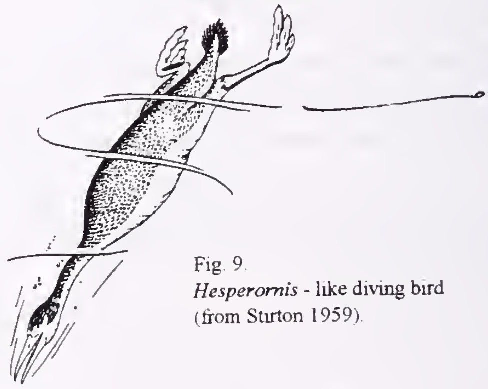


Fig. 9. *Hesperornis* - like diving bird (from Sturton 1959).

Molluscs were the dominant marine invertebrates of the Cenozoic. Gastropods and bivalves, most of them similar to living types, were common in fresh and salt water. Land snails, Gondwana remnants, dispersed to territorial divisions on land. The Cenozoic fossil record is full of molluscan predation examples. Boreholes (Fig. 10) made by the radula of carnivorous gastropods (Fig. 11) and / or octopus beaks are to be found in nearly all molluscan deposits. The horny beak of an octopus is similar to that of a cockatoo's beak, although it is the upper jaw that closes into the lower, and not the lower into the upper. Predation of molluscs by birds, fish, crabs, reptiles, amphibians, sea-urchins, seastars, mammals, and other molluscs continued in the Cenozoic.

The many shapes, sizes, and functions of Recent mollusca are mirrored in the fossil

record. So too are the environments that they lived in. From shell - beds past come details of faunal associations, past predators, taphonomy, and knowledge of animals never again to be seen alive. The mysteries of marine domains now uplifted and exhumed underlines the impermanence of life generally and imparts an awed reverence for natural history. The pressures of past predation are even more so today. Marine mammals, crustacea, birds and fish continue to feed on molluscs, and a new predator, increasing numbers of people, are gathering more of them. Human collection methods are more efficient and where laws limit harvest, are sometimes clandestine and ruthless. The rewards of commercial gain, the introduction of more manageable boats, new technologies and equipment, and better roads has not only increased pressure on existing resources, but also allowed access to previously inaccessible molluscan areas.

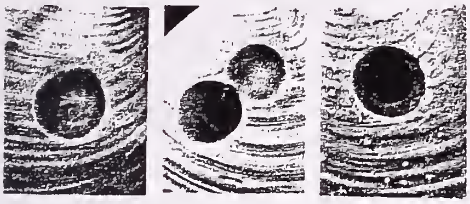


Fig. 10. Incomplete, multiple, and complete naticid borings in *Crassatella vadosa ripleyana* (Conrad), a Cretacous bivalve (from Sohl 1969).

Fig. 11. Side view of radula· rachidian teeth at bending plane (from Carriker 1969).

Bivalve beds and gastropod domains may be regarded as over-exploited when the numbers of a species are reduced to such an extent that the remaining adults are unable to reproduce enough young to maintain the stock. This could be said for Auckland's west coast *Paratrophon cheesmanni* (Fig. 12), a species depreciated last century through either disease, adverse predation, or over - zealous collecting. Some particularly vulnerable species, such as the toheroa (*Paphies ventricosa*) (Fig. 13), have been driven nearly to extinction in several places around New Zealand; over - collecting, an increase in ambient sea - water temperature, lack of suitable phytoplankton food, biotope modification, paddle-crab predation, and vehicular mortality, eventually contribute to molluscan demise. The renewability of molluscan resources depends on accepting controls which not only protects stocks, but also ensures that the environment in which they live does not deteriorate. The challenge is not in enforcing fisheries or pollution regulations, but in convincing the community that they are necessary. Though aquaculture would seem to be the logical answer for replenishment, the results of such endeavours are confined to commercial profit and not rehabilitation of the sea. Present and future generations may need to sacrifice the live collection of many species simply to facillitate the natural maintainence of the marine environment.

Fig. 12. *Paratrophon cheesmani* (Hutton), Motutara (from Powell 1979).

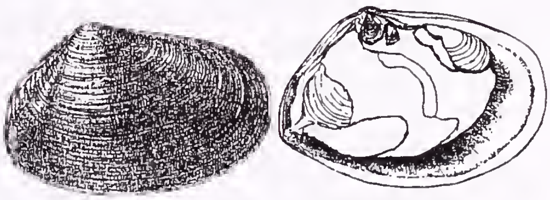


Fig. 13. The surf clam *Paphies ventriocosa* (Gray).

Bivalves are the mainstay of molluscan food stocks. Although most bivalves are dioecious (having separate sexes) several commercially important species are monoecious (hermaphrodite; having both sexes). Hermaphrodite species may be either sequential hermaphrodites, such as the introduced oyster *Crassostrea gigas* (Fig. 14), which have gonads that alternate between being male and female, or similtaneous hermaphrodites, such as *Pectan novaezelandiae* (Fig.15). The recorded world catch of bivalves, mainly clams, cockles, arkshells, oysters, mussels,and scallops far exceeds five million tonnes annually, but a large unquantified catch is taken by subsistance, recreational, and crimminal collectors.

Fig. 14. The introduced oyster *Crassostrea gigas.*

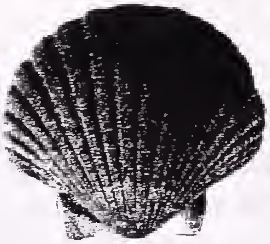


Fig. 15. *Pecten novaezelandiae* (Reeve) (from Powell 1979).

Fig. 16. *Anadara maculosa* Reeve (from Wye 1991).

Fig. 17. *Zygochlamys (Patagonia) delicatulia* (Hutton) (from Beu *et al.* 1990).

Human consumtion of bivalves that have filter - fed on seasonal blooms of toxic dinoflagellates such as *Alexander minuteman minuteman*, can suffer from paralytic shellfish poisoning, as can fish and birds. In many coastal communities, (e.g. Kiribati), intertidal bivalves (e.g. *Anadara maculosa;* Fig. 16) are used as an important source of protein, and the weight of bivalves collected is greater than that of any single family of fish species. New Zealand commercial take of high-value species such as *Pecten* and *Zygoclamys (Patagonia) delicatula* (Fig. 17) are characterised by fluctuations in annual catches as a result of catastrophic natural attrition due to environmental ravage, viral, bacterial, or parasitic infestation, poor recruitment, or excessive predation. Indescriminate release of ballast water in New Zealand marine provinces has introduced exotic species that compete for settling space with endemic species (e.g. *Musculista senhousia;* Fig. 18), sometimes displacing them.

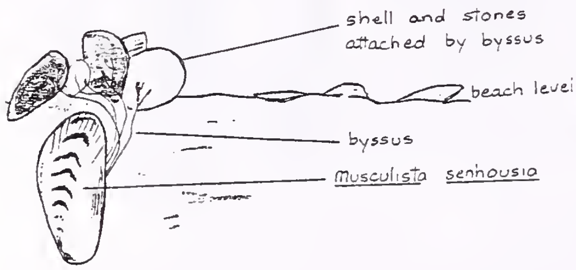


Fig. 18. The introduced mussel *Musculista senhousia.* (from Morley 1988).

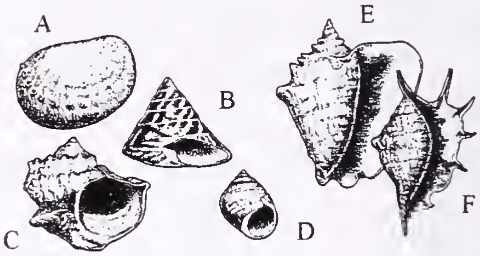


Fig. 19. Subsistance gathered seafood: A. *Halliotis*; B. *Trochus*; C. *Turbo*; D. *Littorina*; E. *Strombus*; F. *Lambis* (from King 1995).

Although only a few dioecious gastropods, particularily abalone or paua (*Haliotis* spp.), are the basis of cosmopolitan gastropod seafood industries, periwinkles (*Littorinia* spp.), turban shells (*Turbo* spp.), conchs (*Strombus* spp.) and spider shells (*Lambis* spp.) are also processed as a food source by subsistance gatherers (Fig. 19). Since abalone (or paua) are the basis of valuable dive food stocks in temperate waters, including New Zealand, they have been the subject of intensive research. Not only is *Haliotis (Paua) iris* the world's longest ranging *Haliotis* species (DNA determined), but the black fleshy meat

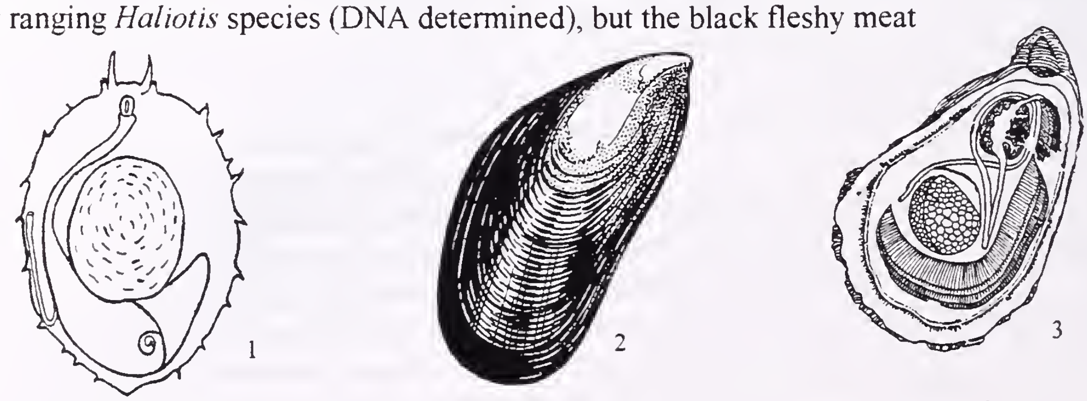
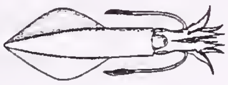


Fig. 20. Commercially valuable species used today in aquaculture: 1. Abalone (*Haliotis* spp.); 2. mussel (*Perna* spp.); 3. oysters (*Crassostrea* spp.) (1 & 3 from King 1995; 2 from Powell 1979).

of the foot is a delicacy greatly prized by the Maori, recreational consumer, restaurant and export trade. Additionally the nacreous pearly inner shell layer of *H. (Paua) iris* is often utilised in jewellery, souveneirs, and in ornamentation. Hence, stocks of shallow-water gastropods (such as *Haliotis spp.*) used for food and of species valued in the shell trade (cowries, cones, turbos, murex), have been depleted in many areas of high population. Commercially valuable species such as abalone, mussels and oysters (Fig. 20) have been artificially cultured to produce food and pearls to satisfy a burgeoning market, not to restock a depleted natural resource. The protection of a large number of molluscan species may only be achieved by the development of marine parks, marine reserves, or voluntary community moratoriums, although the cost of policing a large number of protected areas nation - wide is high. The real cost without intelligent control by individuals and ammeniable community participation, will surely be measured in molluscan species extinction and a greatly deminished marine enivironment in the future.



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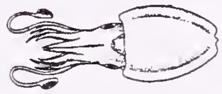

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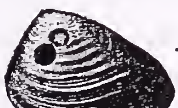

Observations on egg laying at Leigh

Ian Scott

Alcithoe arabica - Egg laying has been observed from April through to December with most activity occurring in the spring months. When egg capsules are first laid they are pure white and soft enough to be dented by a finger. One animal picked up disgorged an egg capsule already attached to a shell fragment. Egg capsules were observed in coarse detritus attached to a variety of shell fragments at depths of 20-22m. Eggs were not attended by adults after laying.

Penion cuvierianus - Egg laying has been observed from August through to November. The animals stay with the eggs and have been observed in groups of 2 to 7 (with 2 to 3 adults being more usual). One group of adults was revisited two weeks later and found to be still in position. In fact the only unattended egg cluster seen was being eaten by *Cominella adspersa.* Targets for egg laying vary from dead *Glycymeris* valves to small rocks and old rope. In the group of seven adults on eggs three had well developed varices and four were smooth on the body whorl.

Penion dilatatus - Egg laying observed once in August.

Buccinulum pallidum powelli
Egg laying has been observed from July to November. Eggs are laid around thin finger sponge arms or around the 'stalk' of seaweed, usually 10 to 30cm above the substratum and at depths of 10 to 20m. Animals often stay with the eggs and vary from 1 to 3 animals per egg cluster. However, some unattended egg clusters have also been observed.

Murexsul octogonus - Egg laying has been observed from May to October with the highest proportion of sightings observed in June. In each case eggs were laid in clusters of 30 to 50 eggs inside empty *Glycymeris* paired valves at depths of 20 to 22 m. Each individual egg is roughly circular, 3mm in diameter, and white to pale grey with a darker spot in the centre. In all but one case 2 to 3 adults were tending the egg cluster.

Cominella quoyana - Egg laying was observed once in October.

Cabestana waterhousei - Egg laying was observed once in December. Eggs were inside an empty *Glycymeris* shell at 20m and one adult was sitting on top of the eggs. The egg cluster was circular and approximately 2cm in diameter.

Cabestana spengleri - Egg laying observed twice, once in December and once in May with adults attending the eggs on both occasions.

Murexsul feeding at Leigh

Ian Scott

Murexsul octogonus - The most frequently observed feeding has been on *Venericardia purpurata* a common species in the sand and detritus at 20 to 22m where this species is found. One specimen was observed feeding on *Cardita aoteana*, and drill holes presumed to be from *M. octogonus* have been found in *Dosinia maoriana, Tawera spissa, Chlamys zelandiae, Notocallista multistriata* and *Corbula zelandica.* However, by far the highest number of 'drilled shells' are *V. purpurata.* Interestingly at the nearby Goat Island Marine Reserve where *M. octogonus* occur on flat algae covered rocks at 10 to 18m the preferred food is *Maoricolpus roseus* with often two specimens seen feeding on the same shell

Murexsul species - The soon to be described species separated from *M. octogonus* in Poirieria 16(1)1989 has only been seen feeding on the common pink brachiopod *Calloria inconspicua*. This has been observed on numerous occasions with the feeding siphon inside the brachiopod. Typically this species is also most abundant on rock walls and overhangs where these brachiopods are also abundant.

Twenty Years Ago

From Nancy Smith

Volume 10. Parts 5 and 6. 1980.

The new and the rare:- Kevin Burch found a freshly dead *Trivirostra merces* (Iredale) while diving at the Poor Knights, Norman Gardner found *Paxillostium nanum* (a small freshwater Hydrobiid found only in Northland) shells in leaf litter with no sign of water. "Further visits to the site showed that this mollusc was living in a wet weather seepage area.... with only a few dead leaves on a little thick mud". Bev. Elliot reported a"perfect live specimen of *Nerita melanotragus* 28mm at South Bay Kaikoura" and wondered if this was a southern record, a diver picked up a big *Turritriton labiosus* 2.5cm at the Poor Knights, Carol Bissett found a washup of about 200 live fully grown *Astrea Heliotropium*" at Oreti Beach. She hopefully put them back in the water. The newly described species *Boreotrophon shirleyi* Cernohorsky was brought up in prawn trawls in the Bay of Plenty. And really exciting was the find of a noted malacologist from the Bishop Museum. " *Amphibola*!" he shouted – "thousands of them! Stop the car!"

People travelled to and recorded their finds from Stewart Island, Hahei , Rarotonga and Aitutaki, Oneroa on Waiheke, Rat Tail reef Fiji, the Far North and the Poor Knights. Richard Willan did his exploring in the gardens of Wellington where he found about 20 species of introduced pulmonate slugs and snails. He found that most people were only to willing to have him collect in their properties!

My Best Find:- Club Trip to Queensland, July 2000.

Nancy Smith.

How excited I was to find Alvinconcha hessleri. This strange gastropod was discovered in 1987 by scientists diving in the hydro-thermal vents area in the Mariana trough. Unnamed and hardly understood, it apparently lived off the sulphur bacteria round the vents. Many life forms had recently been found in this environment but this was the first reported gastropod (see "Poirieria" Vol. 15.No.6,).

And here at the Yeppoon Shell Show was a beautiful specimen on display, named for the submersible Alvin which "found" the first specimen. About the size of a big Helix and covered in a hairy periostracum it looked very fragile. It was donated to the Keppel Bay Shell Club by Jon Singleton of Western Australia who told me that to study the biota of the thermal vents, a foot or more is cut off the top of the vent and taken to the surface to be closely examined. Only inside the vents are the "hairy" snails found, living clustered together, sometimes as many as a dozen of them.

Alvinconcha hessleri coll. At 3500m in Marianas Trench
Photographs : Jon Singleton

Yeppoon and Townsville Shell Show Holiday Trip News
By Betty Headford

Somehow I was the one designated to organise the trip to Australia for those lucky and brave souls who elected to go. It turned out to be a most happy and compatible group and we had a lot of fun and adventures together.

To begin with we all arrived in Brisbane on different flights. I went a few days earlier to visit family and friends. On their arrival I picked up Rae Sneddon and Gladys Goulstone in my little hire car and with my Brisbane friend as guide, the girls "hit the town". We had a most enjoyable day visiting the centre of Brisbane, the old Botanic Gardens, Government House, Parliament, The Art Gallery, South Bank and Mt Coot-tha Botanic Gardens. We were glad that night to enjoy the relaxing hospitality of my friends, Judy and Terry, on their property at Minden.

The next morning, bright and early, we were at the airport to meet Nancy Smith and wait for Glenys and Kelvin Stace. Glenys had decided to take her geological hammer in her cabin baggage! Of course it showed up in the xray -an offensive weapon! So they took it off her. We wondered why they were the last out. They had had to wait for the delivery of a specially consigned parcel - her hammer.

Having finally got the group together, all we had to do was change vehicles, upgrading to a Toyota Tarago. (Previa to you) We soon nicknamed it" The Purple Wombat" for obvious reasons. Sitting in the drivers seat was like sitting in the cockpit of a plane. It coped with our mountain of luggage, which Kelvin became very adept at stowing, despite the growing collections of shells, rocks and fossils. It seated us all in comfort too. Glenys, Kelvin and I took turns at the driving, the other three electing to be chauffeured.

We had a quick look at Brisbane for Kelvin (his first visit) and then headed up the Bruce Highway to Gympie, rock museums and lunch. Maryborough and its beautiful renowned old architecture was our next stop before going on to stay the night with my relations in Hervey Bay.

The girls did the obligatory early morning sweep of the beach and photographing some beautiful rock formations on the shore. Then it was head for Yeppoon with a detour or two. First we went to Woodgate Beach and National Park (important to me as its named after my forebears) Its a long sweep of golden sands where we collected some beach washups, Paphies cuneatus, P. elongata, Natica Iavendeula

Reluctantly we drove on to Bundaberg the "Rum Capital" They have lovely botanic gardens. It was a nice setting for lunch. and visited by interesting birds (of the feathered variety) So after a little dalliance it was off to the Mystery Craters at South Kolan. A very strange creamy coloured rock with big red lumps of inclusions has weathered to this cratered moon-type landscape. And it seems confined to a small area about a quarter acre section in area. Very intriguing! They had examples of fossilised wood and a good rock collection. I snuk across the road and found my Great Grandparent's graves. We had seen the old homestead earlier.

By now we had established our interests were very wide, but we were all interested, some enthusiastically and that was infectious. Soon it was "look Nancy there's a bird - what is it?" "look at that fabulous araucarian skyline Glenys. Do you want to photograph it?" "Wow what unusual flowers Bet you want to photograph those Gladys and Betty." "Do you want to stop?" "What interesting old architecture Kelvin" etc.

We eventually got to Yeppoon and found the Pointsiana Caravan Park where Ena Coucom had booked us in for four days.

Yeppoon is an interesting little seaside town, starting to flourish but still with character. The up market big Capricorn Resort is just a few kms up the coast. We visited their fabulous wetlands and saw many wonderful birds - bustards, egrets, wedge-tailed eagles, jabirus and many ducks to name a few.

The Shell Club people at Yeppoon were very hospitable. Nancy and Rae were roped in to do some judging. So the rest of us snuk off to Kinka Beach and a wonderful variety of species in the washup. (See species lists attached)

We spent time (and Rae lots of money) at the Shell Show. Being a novice I found the entries in the various classes and their presentation very interesting. My favourites being the collections of Australian shells and the presentation of the interesting variety of entries with the Olympic Games as the theme I wished I had taken more photographs but it was difficult with the lights on the glass tops. There were some very interesting educational displays. There were also a lot of trading tables with some very enticing buys.

We really enjoyed our time in Yeppoon not only for the hospitality, the beaches and shells but also for a couple of day trips we did. One was to the beaches and Emu Park and then into the Rockhampton Botanic Gardens. There we saw a wonderful variety of araucarias and palms and cycads. Another day we drove to Mt Morgan an interesting old gold mining town with a wellcared for old railway station and old steam train and locomotives. From there we drove to Mt Hay. That is really worth a detour. Its an amazing old volcanic site with wonderful rocks - obsidian to spherolyticai rhyolite and of course the famous Thunder Eggs. We found it really worthwhile taking the tour and getting all the information as well as being shown how to find the Thunder Eggs. They later cut our finds for us and we had some really lovely ones. More stuff for Kelvin to pack. From Yeppoon, driving north, we took a little detour to try to find the Chrysoprase Mine, which we eventually did up a long dirt road behind locked gates. We did find samples close by as well as being rewarded by beautiful scenes of massed wattle in bloom, lots of birds, wallabies and strange fungi. We also found the Old Marlborough township site with giant waterlillies, granite formations and huge freshwater mussel shells and other shells.

Onward, we called into Clairview for a walk on the beach. Clairview has two Dugong Wildlife Reserves which unfortunately we didn't have time to visit. We were expected in Mirani for dinner. Mirani is a town west of Mackay, in the sugarcane country. We stayed with Daphne and Doug Ruthenberg (Shell Club people). Great hospitality and a wonderful shell collection to view especially in the Cypraeidae, Haliotidae, Olividae and Pectinidae families. They sent us off with enough of Doug's frozen mango to last us to Cloncurry. . . YUM!

On the road again we called in to see Marge Peach and her beautiful collection of shells. She lives just north of Mirani.

Our next call was to Prosepine and then out to Airlie Beach (and Shute Harbour) to have and look around. Airlie Beach is rather Touristy and at the moment undergoing a big revamp (remake?) of its beach and making a safe lagoon.

We were soon on our way, on a dirt road, driving through Brahmin cattle, to stay at Dingo Beach for a few days. Nancy and Rae, who have frequently been to shell there, had assured us it was worth the trip. And it was! We stayed at the only motel and very nice it was too. It was just a walk across the lawn to the beach. Dingo Beach is a little paradise, still not touristy and very good for shelling, snorkelling, fishing, boating and just relaxing. We found lots of shells and other interesting sealife. (See list) There are wetlands there too with an amazing variety of birdlife. We even had a "sun bird" tapping at our window.

All too soon it was time to move on. We found Gordon's Beach just before Bowen. There were several varieties of mangrove growing there with lots of littorina species attached. Bowen has beautiful murals and just north is Inkerman Hill with pink granite sides and views to far horizons. We visited a "rock" Museum in Home Hill and admired the miles of sugarcane all the way to Ayr and Beyond. If you are ever in Ayr do not miss The Butterfly House. It is the amazing lifetime collection of Australian natural history of The Eys's.

But Townsville and the Shell Show were calling. Bev Swan had graciously insisted we all stay with her. So we duly arrived while she was up at the Cutheringa Hall helping to set up the Show. We made ourselves at home in her front room "The Swan Hilton" before joining them for a preview of

the exhibits and dinner with the locals. The green cloths on the tables and the plants scattered around helped set off the wonderful exhibits. The competition tables were set out in the main body of the hall with the trading tables down the side walls. The dining area at the far end and the bar next door made for a very convivial atmosphere. There were many beautiful entries and a fascinating category for "shells with passengers'. When Ng flew in late to spread out his amazing selection for sale it was just like a feeding frenzy.

Townsville was a social whirl and lots of fun thanks to the wonderfully hospitable people. And special thanks to Bev for letting us all "roll out our swags" on her lounge floor.

Early Sunday morning, five of us, Glenys & Kelvin, Nancy, Gladys and I, were setting off on the next stage of our Oz Adventure. We were going way out west into the Outback. We sadly said goodbye to our new friends and goodbye to Rae who had to fly home. We would not forget her in fact it took a long time to stop making her lunch for the day.

The next half of our holiday with more adventures and fun was just beginning. But I'll tell you about that next time.

Species list of some of the shells found on a few of the beaches. (Incomplete)

Kinka Beach, Yeppoon

Epitonium scalare, E.cooperi, 2x Turridae species, Clavis formidabilis, 3x Cancellaria, Cancellaria elegans, Murex brevispina, macgillivrayi, Morula marginalba, Nassarius conoidalis, N. dorsatus, N. crematus, N. luridus, Polinices simiae, P. sordidus, P. conicus, P. didyma, Natica onca, Oliva caldonis, Mitrella semiconvexa, Solen kajiyamai, Mactra contraria, M. Abbreviata, Placamen calophyllum, P. tiara, Nerita balteata

Dingo Beach

Pupa sulcata, Atys cylindricus, Haminoea wallisi, Hydatina physis, Strombus canariuni, S labiatus, Peristernia australiensis, Milda ventricosa, Otopleura auriscati, Vexillum rugosum, Natica gualtieriana, Morula granulata, Cronia aurantiaca, Nerita polita, N. squamulata, N. undata, N. albicilla, Thais keineri, Phasianella, Planaxis sulcatus, Herpetopoma atrata, Eunaticina papilla, Sinum javanicum, Pyrene testudinana, Monodonta labia, Stomatia phymotis, Morula margariticola, Siphonaria sp, Clypeomorus batillariaeformis, Cerithriuni novaehollandia, C. zonatium, Cerithrium sp, C. Echinatum, Cronia margariticola, Clanculus johnstoni, Gafrarium menkei, G. dispar, G.tumidum, Acrosterigma (cardium) reevianum, Lioconcha spp, Fragum fragum, Chama, Arca, Cardita, Atar, Pita citrina, Asaphis violacea, 2x Tellina

Gordons Beach

Nerita oualaniensis, Telescopia telescopia, Strombus canarium, Terebralia palustris, Polinices sordidus, Pyrazus ebeninus, Cvpraea xanthodon

Front: Rae Snedden, Gladys Goulstone, Nancy Smith, Betty Headford
Back: Glenys and Kelvin Stace

Twenty Years Ago

From Nancy Smith

Vol.10 (1979/80)

Several people listed the shells they had gleaned on visits to Resolution Bay in the Marlborough Sounds, Oriti Beach near Invercargill and Te Arai north of Auckland. Bert Lee, commercial fisherman, dredged from Cape Runnaway to Table Cape on the East Coast, and listed some of the smaller and more interesting finds he had made, with localities.

Derek Lamb described the collections of Joan Coles and Miss Holloway and Mr.Stevenson. The latter two tended to amalgamate their collections then seperate them, then join up again! I wonder what happened to that magnificent array? Joan of course is still a loyal and active member of the club.

I know some people distinguish the two species of *Soletellina* by shell colour - I started off that way myself- but the colour is not always reliable. A safer way is to look at the outline and hinge and this is nicely described by N.W.G.

In November 1952 J.E.Rosenbaum bravely tried to teach people how to pronounce scientific names. This useful article was reprinted in 1979.

Acteonidae: those small uncommon treasures *Pupa* and *Acteon*, were known and described in 4 species. They are mostly northern shells best obtained by dredging. Norm added that there were records of other deep water specimens which could be new species, but Spencer and Willan have only added *A. variegatus* and two species of different genera to this family.

Trips previously taken by club members,to Norfolk Is. and New Hebrides (Vanuatu), were reported with lists of shells and drawings. Derek visited Mrs Dulcie Thomson's collection, which included Mrs J.Wyatt's collection of Cones. Here the very fine and the scarce outweighed the ordinary and the common!

Commoner *Rissoina* from northern beaches are described with useful drawings to help distinguish one from the other. Among the interesting short articles is a *Cellana denticulata* 84mm by 70mm.

Wandering molluscs:-

Hamish Spencer raised questions about the habitat of *Leuconopsis obsoleta* which he and Prof. Morton were surprised to find under low tide rocks.

R.C.Grange remarked on the range of *Turbo cepoïdes* which wasn't sticking to its home location of Lord Howe Is. and Betty Grange reported Chlamys asperrimus asperrimoides found in sponge at Kaimoumou Beach was usually found in the Norfolk Is, Kermadec Is area.

B.Hazelwood reported a first from N.Z.: *Segmantina complanata*. Bev. Elliot had found this little freshwater snail in the Pool in Brooklands, New Plymouth.

Various species of our *Rhytida* landsnails have wandered from Three Kings to Stewart Is. Quite a trek for these wee creatures, but they may have started out in the Pliocene epoch according to C.G.Dawber (Junior member)

Cryptic molluscs:-

Pseudovermis hancocki had only been found twice. This tiny - 4mm, colourless nudibranch lives in clean sand on the seafloor. The holotype and the second specimen both came from the Bay of Islands.

Horatia nelsonensis is one of a group of tiny fluvatile snails which you will only find by exploring deep wells and caves, where they live in cold, dark subterranean water. Examples of each of 6 genera are illustrated.

CRAB PREDATION ON THE SMALL INTRODUCED BIVALVE, *THEORA LUBRICA*

by **Bruce W. Hayward and Margaret S. Morley**

Two years of monthly monitoring (September 1997-August 1999) of populations of the introduced small semelid bivalve, *Theora lubrica*, in a low tidal, muddy habitat in Hobson Bay, Auckland (Hayward et al. 2000), revealed considerable variation in density (30-850 per sq.m). During this time, six cohorts (populations that settled and became established at about the same time) were identified, based on the seasonal change in the size composition (Fig. 1). These cohorts show slower growth rates and longer-lived populations in cooler months (0.5 mm per month, 6-8 months longevity) than in the summer (2-3 mm per month, 2-3 months longevity). Significant die-offs occurred in spring in both years, but the very low densities of summer 1997-98 were not matched in the summer of 1998-99 when the highest densities were recorded (Hayward et al. 2000).

Controlled feeding trials showed that a native mud crab, *Macrophthalmus hirtipes*, was a major predator of *Theora lubrica*, with the capability of one crab consuming up to 7 of these small bivalves per day (Hayward et al. 2000). Our monitoring revealed a correlation between high crab numbers and low *Theora* densities and suggested that crab predation might control *Theora* density in Hobson Bay (Fig. 1).

In order to further investigate the hypothesis that crab predation impacts on the density of this small bivalve, we undertook two further population samplings at our study site, in November 1999 and January 2000 (Fig. 1). The results were similar to the summer of 1997-1998. The March 1999 winter cohort (F) survived in low numbers through to at least January 2000 (10 month longevity). New recruitment of summer cohorts was not evident in November 1999, but had started by January 2000 (G). A significant decline in density of *Theora* occurred in spring 1999 (350 per sq.m in August to 35 per sq.m in November) and was matched by a major increase in the density of mud crabs (3 per sq.m in August to 74 per sq.m. in November). High numbers of crabs (38 per sq.m) and the low density of *Theora* (66 per sq.m) continued through summer, just as it had in the summer of 1997-1998 (Fig. 1).

The two additional population studies confirm our earlier observations on the longevity and recruitment times of *Theora lubrica* in New Zealand and provide further strong support for the hypothesis that the mud crab *Macrophthalmus hirtipes* feeds on this small introduced bivalve and controls its density. Considering the abundance and widespread occurrence of *Theora* in the Waitemata Harbour (Hayward et al. 1997, Hayward 1997), its introduction must have caused major changes to the food chain and ecological balance throughout the harbour.

Acknowledgements

We thank Jessica Hayward for computing and drafting the graphs.

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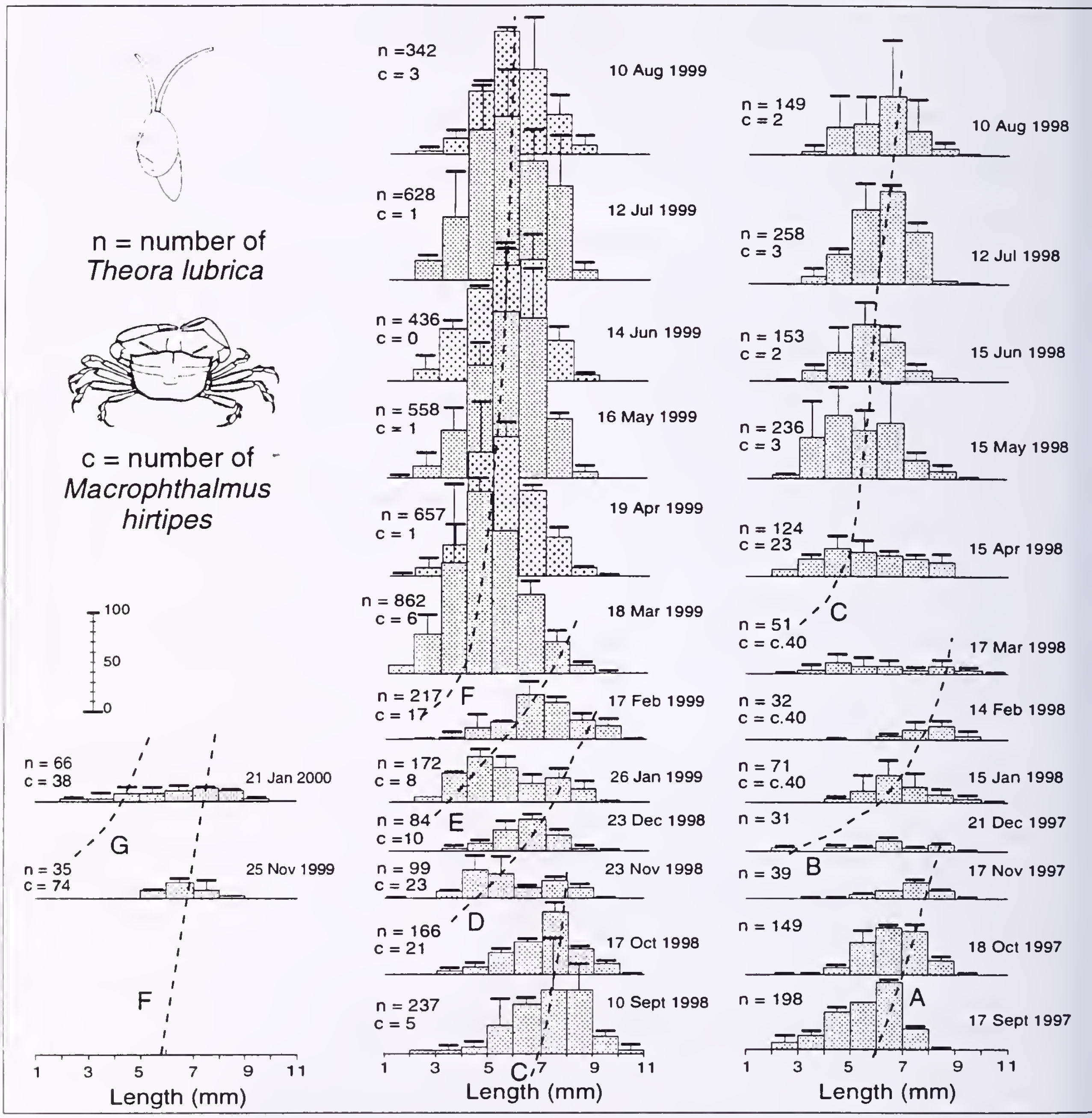

Fig. 1. Histograms showing the monthly size distribution and density (number, n, per sq.m) of low tidal *Theora lubrica* from Hobson Bay, from September 1997 to January 2000. Bars show standard deviation of numbers in each size class resulting from two replicate quadrat samplings. Dashed lines show interpreted growth of successive cohort populations (A to G). Number of crabs, *Macrophthalmus hirtipes* (c) per sq.m is recorded after Jan 1998.

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PREDATOR PATROL

Michael K. Eagle

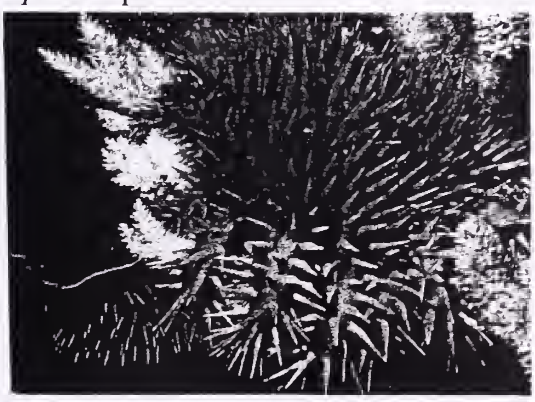
In the early sixties *Acanthaster planci*, commonly known as the crown-of-thorns seastar, was an almost unknown animal. A population explosion suggested that the echinoderm was capable of eating out the Australian Great Barrier Reef corals, potentially destroying it. The infestation engendered public concern and scientific research. Widespread infestation burgeoned, but the catastrophic demise of the reef didn't happen. In the mid-1970's, for whatever reason, the numbers of *Acanthaster planci* waned, and the reef survived. Then, in the mid-1980's, the seastar reappeared in uncommon numbers to once again plague the Great Barrier Reef. Emotional reaction to the seastar and confusion and frustration in the management of the perceived problem exacerbated in the wake of the manifestation.

After three decades scientists are still divided over whether or not the crown-of-thorns seastar infestation events were a product of natural fecundicity or an unnatural response to the environment. The conventional view of the crown-of-thorns phenonomen accepts that it is cyclic, or does it reflect human interference in upsetting the balance of nature? Cyclic echinoderm explosions as a natural event are known to occur. When resources are plentiful, they increase survival potential of species in environments where adverse conditions are the norm. However, there always exists the possibility of human-induced conditions, the problem of how to manage the population pressure of human-kind in relation to the environment; when to interfere or to simply co-exist?

SYSTEMATICS

Order:	SPINULOSIDA Perrier, 1884
Suborder:	LEPTOGNATHINA Spencer & Wright, 1966
Family:	ACANTHASTERIDAE Sladen, 1889
Genus:	*Acanthaster* Gervais, 1841
Species:	*A. planci* (Linne, 1758); type species by original description.

A. planci is an awesome creature - a perfect predator and coral-killer. Food is mainly coral, but molluscs are also known to be eaten. Corals store their energy as wax, a substance most marine animals cannot digest. *A. planci* has a strong wax esterase enzyme to break down this wax. Living, hard corals, particularly flat, plate corals (*Acropora* and *Pocillopora* spp.) are a favourite prey. Hundreds of small, yellow, suckered feet grip the coral while the seastar exudes its stomach over the coral polyps thin tissue. Digestion occurs externally, taking five to six hours to convert coral polyps covered by its body into a nutritious "soup". Since the seastar is most vulnerable when its stomach is exposed, the "humped" nature of the animal with aboral poisonous thorns erect provide a protective armoury. *A. planci* spawn in summer and their fecundity is astounding.



Acanthaster planci devouring coral polyps on the Great Barrier Reef. When under attack the crown-of-thorns seastar gathers itself into a hump with poisonous thorns erect.

The seastar releases tens of millions of eggs into the water column where they are at the mercy of salinity, temperature, current, and filter-feeding predators, including coral polyps! Planktonic embryos of asteroids such as *A. planci* develop quicker than brooded ones. The time from first to second cleavage (an early embryonic cell cycle), suggests constraints for cell cycles that influence the evolution of development rates. Planktonic embryos with large eggs hatch at a later stage (gastrula instead of blastula), and at a greater age, decreasing time to first swimming - an evolutionary trade-off in echinoderm cell durations. However, among planktonic embryos of marine animals, cell cycle durations and times to first swimming are slower in echinoderms than in many other phyla. A nearly perfect correlation exists between breeding periodicity and the mode of larval development. This correlation suggests possible links between larval timing and the availability of planktonic food. Crisp's Rule (spawning at the time when feeding is most favourable for planktotrophic larvae) appears to hold for some shallow water seastars such as *A. planci*, though the exogenous factors that control gametogenic timing are often co-variates of plankton abundance, not the plankton itself.

For six months larvae of *A. planci* feed on plankton, then settle out of the water column, develop their spiny backs, and commence feeding on corals! After two years of lacklustre adolescent development the patrolling predators of the reef become mature and multi-coloured. Predation of coral by *A. planci* is startling. For example, in May 1983, on the windward slope of John Brewer Reef, northern sector of the Great Barrier Reef, Australia, at a depth of 20 m, a count of in excess of 100 seastars per minute was recorded by scuba traverse. In two months the reef's coral cover of 35 percent had diminished to less than 5 percent - normal cover for these mid-shelf reefs is estimated at 35 to 40 percent. Yet some reefs were never hit. Controversial speculation suggests that nutrient run-off from near-by land after heavy rainfalls, particularly following dry years, may support extra numbers of crown-of-thorn larvae near the Great Barrier Reef. Then there are those who say plagues of *A. planci* are provoked by humankind's interference with the ecosystem; the "souveniring" and over-fishing of natural predators including the taking of the giant triton (*Charonia tritonis*) and netting of coral trout and cod. Neither of these explain the infestation of New Zealand's northern Kermadec Island Group, where it is thought that Eastern Australian Current larval dispersal has added another dimension to their distribution.

Offshore from Raoul and Meyer Islands in the Kermadec Island Group *A. planci* typically grow to between 25 and 35 cm, similar to those on the Australian Barrier Reef. As on the Barrier Reef, Kermadec *A. planci* grow any number from 9 to 23 arms and spines up to 5 cm long. Whilst snorkling among submarine volcanic boulders off Meyer Island in 1998 the author observed them moving at between 20-30 cm per minute; the seastar seems to be able to move quickly on their hollow tube-feet, hydraulically operated and developed for instant adhesion when under threat. The arm tips of crown-of-thorns starfish have red, light-sensitive spots which work like primitive eyes to determine patches of sunlight and shade. Selective locomotion was observed. Specimens of *A. planci* collected by the author on display in the Auckland War Memorial Museum "Oceans Gallery" are representative of the Kermadec population, 31 of which were sighted in one snorkel-swim in the immediate vicinity of the southern sector off Meyer Island in early September 1998.

Much of the crown-of-thorns mystique is that they seem to be immortal. They fade from infested reefs for no apparent reason, often before the coral is totally depleted. Science still has no clue as to how or why they may die by their hundreds; post-mortem skeletons disarticulate quickly in sub-tropical/tropical waters. Speedy migration is a possibility, as is predation, poisoning, cannibalism (manifest in the laboratory), and a short life cycle. D.N.A. and larval biology of *A. planci* suggest it to be a relatively recent species, only tens of thousands of years old. It is not surprising then that no fossil occurrence has been recorded.

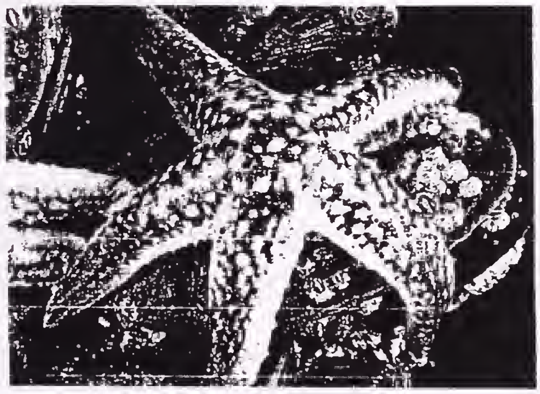
The historical establishment of Australian marine fauna, now including *A. planci* in the north of the Kermadec Islands Group, enhances the spectre of further invertebrate immigration from across the Tasman Sea. Just as viable is the possible colonization in New Zealand of the northern Pacific seastar *Asterias amurensis.*

SYSTEMATICS

Order:	FORCIPULATIDA Perrier, 1884
Suborder:	ASTERIADINA Fisher, 1928
Family:	ASTERIIDAE Gray, 1840
Subfamily:	ASTERIINAE Gray, 1840
Genus:	*Asterias* Linne, 1758
Species:	*A. amurensis*

A. amurensis has five arms covered in spines with the arm-tips pointed and turned-up. Adult *A. amurensis* are coloured yellow to red/purple and measure up to 46 cm across. Originally known from northern places such as Japan, *A. amurensis* probably arrived in Australia via ship ballast water. Since then, the echinoderm has moved down the southeastern New South Wales and Victorian coastline to Tasmania. There, as in other shallow water coastal environments that it has invaded, *A. amurensis* has greatly affected native benthic marine communities. In the Derwent Estuary, Hobart, the seastar has reached plague proportions. It has been observed there feeding

An adult *Asterias amurensis* from the Derwent Estuary Tasmania, Hobart, Australia. A generalist predator, it has been observed feeding on a wide variety of invertebrates.



on a wide variety of invertebrates including molluscs, crustaceans, annelids, other echinoderms, and some chordates (ascidians and fish carcasses). It appears that *A. amurensis* is a generalist predator, but inside the Derwent Estuary has manifest a preference for infaunal bivalves, particularly the Australian commercial cockle species *Fulvia tenuicostata.*

Pacific Rim seastar plagues have been recorded from Japan to Australia since the mid-sixties. They may have occurred earlier and gone unnoticed before widespread tourism and the invention of scuba. Epidemic spawning of shallow water seastars, for whatever reason, can result in vast numbers of voracious carnivores with the potential to decimate whole communities. The Kermadec Islands have been home to *Acanthaster planci* for a number of years now and only time will reveal what modifications (if any) have been wrought on the environment there. *Asterias amurensis* has, so far, not been recorded from New Zealand. Given the adverse impact expected of such a colonization at comparable latitudes, particularly on native benthic marine communities, we can only remain vigilant and hope that the situation remains that way.

CHANGES TO THE INTERTIDAL BIOTA 1950'S -2000 AT HOWICK BEACH, AUCKLAND

Margaret S. Morley[1], Bruce W. Hayward[2] and Arthur White[3]
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SUMMARY

Two hundred and nine species, including 151 marine mollucsa (7 chitons, 90 gastropods 53 bivalves and 1 scaphopod), 11 seaweeds, 9 crabs, 7 polychaetes, 6 sea squirts and 6 barnacles, are recorded from Howick Beach, east Auckland. The majority of the species were found by the authors (MSM & BWH) during a field day for the public on 27 November 1999 and on 21 January 2000 during spring low tides.

Shells collected by Arthur White in the 1950's and information on their abundance, show that the molluscs at Howick Beach have suffered severe decreases in abundance, diversity and size from the 1950's to 2000. These changes are similar to those occurring in the wider Waitemata Harbour. It appears that the main causes are loss of habitat, siltation, tributyl tin (TBT) and harvesting. Despite this depletion the western shore platform at Howick Beach still supports the most interesting and diverse fauna living along the coast.

The sea grass *Zostera* which virtually disappeared in the 1950's has reappeared at Howick Beach. A severe algal bloom which occurred in 2000 is reported.

INTRODUCTION

Arthur White

Since Arthur White's death in April 2000 his collection of molluscs from Howick and the surrounding district made between 1950 and 1959 has been donated to the Auckland War Memorial Museum by his cousin Irene Warbrooke. This collection with its size and qualitative data, provides a detailed snapshot of the fauna at Howick in the 1950's (1 chiton, 50 gastropods, 25 bivalves). The collection from the surrounding district comprises 34 gastropods and 25 bivalves. A few of these are additional species to those collected at Howick.

Arthur was a member of the Conchology Section of the Auckland Institute and Museum and was a keen collector of natural history objects. He worked for many years as the carpenter for the Howick Historical Museum and on the historic Shamrock Cottage in Howick. He followed that as a volunteer at the Howick Information Centre, where he used to regale the visitors with stories of the old days (Alan La Roche pers.com.). One of these was the fishing up of an octopus with an arm span of two metres off Howick wharf, now demolished! On another occasion he noted that rats feed on *Amphibola crenata* and shore crabs and that *Nucula* are found in the crops of godwits. In 1938 a Mr Bushell transplanted some toheroa from Dargaville to Howick Beach but they were washed ashore (A.White unpublished lecture notes).

We are indebted to both Arthur and Irene for the knowledge his collection and notes provide.

Howick Beach

Howick is a relatively small, moderately sheltered beach facing the north east (Fig. 1). It is bordered at each end by eroding cliffs of Waitemata Sandstone. The sandy beach area is about 300m long. At low tide there is a wide expanse of sand and shallow water extending almost a kilometre seaward. There is an extensive intertidal rock platform with narrow gullies and turnable cobbles and slabs at the west end.

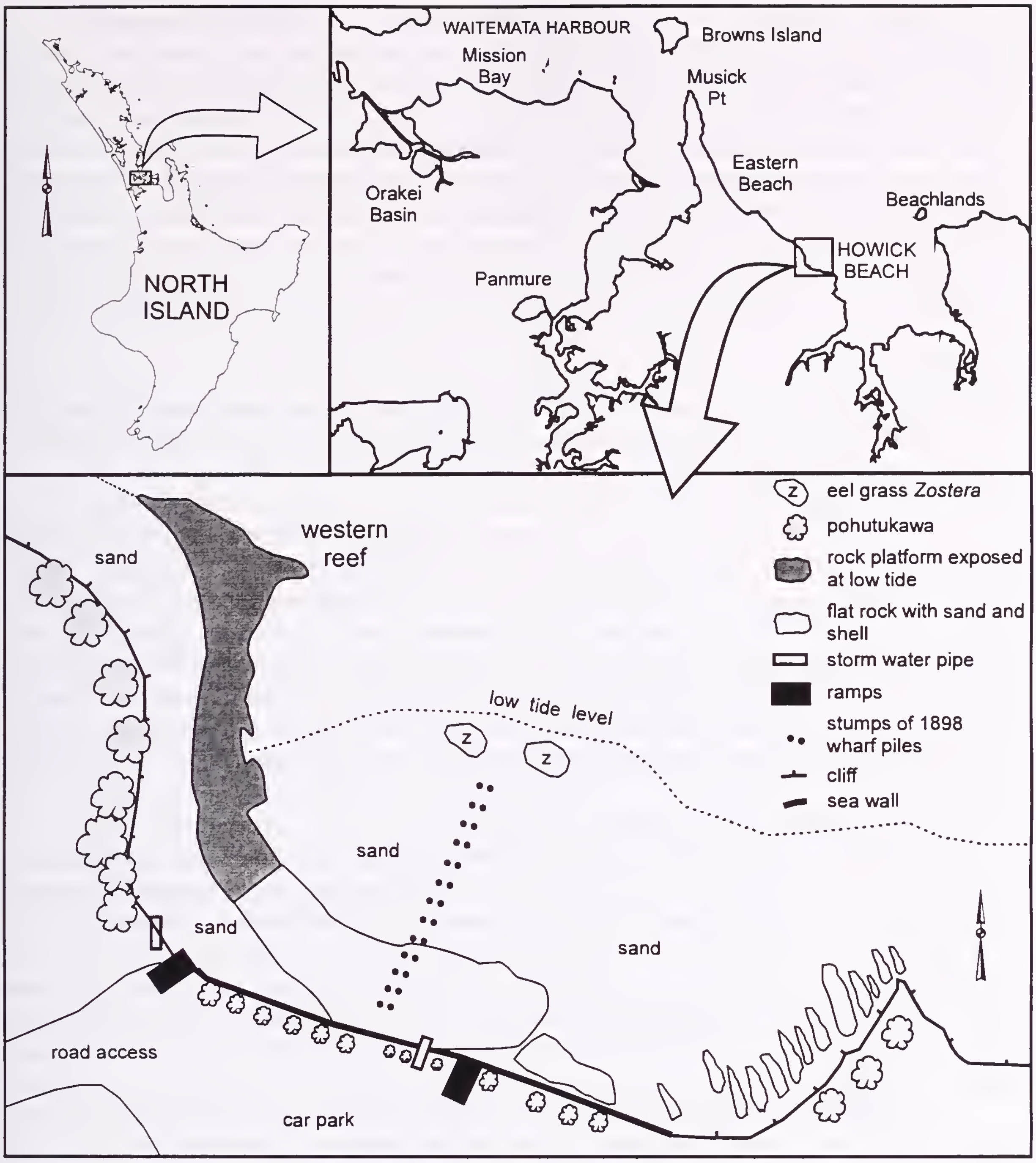

Fig. 1. Sketch map of Howick Beach study area, eastern Waitemata Harbour, Auckland, North Island (not to scale).

Although this area is still relatively healthy and provides habitat for many common marine species it has been degraded over the last 30 years by human activities, especially successive deposition of quantities of silt (pers. obs.). The possible sources of this silt include the damage done to the foreshore during the installation of the sewage line which runs at high tidal level from Shelley Park to Howick; dumping of dredged mud near Brown's Island in 1967, when Half Moon Bay Marina was developed; and silty run-off from land development in local water catchments areas. In last 5 years, there appears to be an improvement with a reduction in the amount of silt on the intertidal area (pers. obs.).

Road run-off flows across the beach at the western end and in the centre from large drainage pipes. Manukau City Council monitor bacterial levels on all beaches throughout summer. A problem of sewage flow at Howick Beach, especially after heavy rain, causes intermittent closures for swimming and shellfish collecting. Council workers have been unable to locate the source of the sewage which may be coming from illegal wastewater connections or botched plumbing jobs. The Manukau City Environment Officer says that the intermittent flow of sewage is an increasing health risk. 'No Swimming' signs were erected for a large part of the 1999-2000 summer season despite the fact that Council reports show that the indicator organism enterococci exceeded the recommended maximum on only two occasions.

Recent Proposals

Recent proposals caused concerned residents and the South Auckland Branch of the Royal Forest and Bird Society to request a survey at Howick Beach to provide basic biotic data.

1. To build a wharf in the centre of the beach.

This wharf would need to be one kilometre long to reach deep water. By halving the beach with an obstacle, it would prevent the local children yacht racing. A wharf is seen as visual pollution by some members of the public, while others thought it would be desirable, providing access to deep water for boats, a pleasant walk and for fishing. The first Howick wharf was built by the army in 1854 for use at high tide only. At this time sea transport was preferred due to the unsatisfactory state of the roads and the unpredictable ferry at Panmure. In 1898 a 900 foot (290m) wharf was built, even this wharf could not be used at low tide (La Roche 1991 p156). The stumps of the 1898 wharf piles can still be seen at low tide (Fig. 1).

2. A ferry terminal for boats sailing to the city

This ferry would probably start from Pine Harbour, Beachlands, calling at Howick, and Halfmoon Bay, Tamaki Estuary on the way. This project was promoted by the local business community. To achieve this a major proportion of the western shore platform (Fig. 1) would need to be reclaimed so that the ferry terminal could be in sufficiently deep water. It was suggested at a meeting that a road and car park could be placed below the cliff! Soon after the meeting heavy rain caused large rocks and a mature pohutukawa to fall down the cliff and spread across the beach for 15m. At times strong northerly winds would prevent ferries berthing at Howick.

Both these proposals met with strong public opposition and have been shelved, although the ferry option remains in the district scheme. However because these developments have a habit of reappearing on agendas, members of the community wanted to be prepared with data on the existing flora and fauna. They need facts to present to future hearings when habitat and marine life is threatened.

PREVIOUS STUDIES IN THE WAITEMATA HARBOUR AND INNER HAURAKI GULF

Many studies, some unpublished, have been done in the Waitemata Harbour. The following are some that are relevant to the study at Howick.

* A survey of subtidal soft bottom marine biota of the Waitemata Harbour was done by Dr Powell between 1926 and 1936 (Powell 1937). The species recorded from a total of 149 dredge stations were used to map faunal associations, including the subtidal area north of Howick Beach.

* Study of the soft intertidal shore at Howick Beach was undertaken by Donald Wood (1962), and summarised in Morton and Miller (1968, p.486-490). Wood studied the migration of pipi *Paphies australis* down the beach during growth, showing that this occurs in or after the first year of life. *P. australis* is described as abundant with densities of 1500 per m^2 on the lower beach. The cockle *Austrovenus stutchburyi* reached a maximum density of 1900 per m^2, the wedge shell *Macomona liliana* 60 per m^2, the biscuit shell *Dosinia subrosea* 30 per m^2. On the *Zostera* flat, the date mussel *Solemya parkinsoni* had a maximum density of 80 per m^2 and the nut shell *Nucula hartvigiana* 2780 per m^2. He comments that the *Zostera* flat had a distinct fauna of its own, with the bivalves *N. harvigiana, S. parkinsoni* and *Ruditapes largillierti,* the rissoids *Eatoniella zosterophila* and *E. limbata* in densities of 2500-5900 per m^2. The small limpet *Notoacmea helmsi* and the top shell *Diloma subrostrata* were numerous, both grazing on algal covered coarse shell with a maximum density of 200 per m^2. The carnivorous whelks were recorded in heaps of up to 40 specimens of *Cominella adspersa* and 80 *Cominella glandiformis.* The olive shell *Amalda australis* was common at low tide.

* Two papers by Armiger (1964, 1965) reported the occurrence of a fungal slime, *Labyrinthula* which destroyed the majority of the eel grass *Zostera* in New Zealand including Howick and the whole of the Waitemata Harbour.

* Dromgoole and Foster (1983) documented changes, mostly from introduced species, that had occurred in the marine biota of the Auckland Harbour in recent decades.

* A study of faunal changes in the subtidal Waitemata Harbour sediments 1930's-1990's (Hayward et al. 1997a) covers all the Waitemata Harbour extending to Bean Rock in the east and Rangitoto in the north. This records changes since the 1930s, including introduced bivalves *Theora lubrica, Limaria orientalis* and *Musculista senhousia.* Six species were commonly recorded alive by Powell but were absent or greatly declined in the 1990s. These are the olive shells *Amalda australis,* and *A. novaezelandiae,* and the bivalves *Tucetona laticostata, Neilo australis, Dosinia lambata* and *Tellinota edgari.* Carnivorous gastropods are the dominant group to have suffered major declines followed by deposit and suspension feeding bivalves and a herbivore.

* Recently, similar decreases to those shown in this study in diversity, abundance and size of the molluscs at Oneroa, Waiheke (Morley 1980, 1986) have been noted (MM pers. obs.).

* A survey of Beachlands and Motukaraka Island (Morley et al. 1998) in 1997 recorded 87 molluscs, (6 chitons, 45 gastropods, 36 bivalves). Comment is made on the sources of silt and its severe detrimental effects on the intertidal biota. It is noted that cockles were small (averaging 15-20 mm in length) and the majority of pipi were juveniles.

* A paper on the human impact on Orakei Basin (Hayward and Hayward 1999) documented the dramatic changes to the fauna caused by the ponding of the Basin behind control gates in the 1920s. Prior to the 1920s the Basin had a firm shelly sand or mud floor with abundant cockles, pipi, snails and bivalves, numerous mud crabs and polychaete worms. The Basin is now covered in a thick layer of soft mud supporting heavy seasonal algal growths which cause foul smells when they rot. The fauna is dominated by marine invaders especially the Asian date mussel *Musculista senhousia.* A belt of huge Pacific oysters *Crassostrea gigas* grow out of the mud.

* A map and accompanying notes has been published showing intertidal and subtidal biota and habitats of the Waitemata Harbour from Riverhead to North Head (Hayward et al. 1999a).

* Ministry of Fisheries surveys of edible species were done at Howick, Eastern Beach and Bucklands Beach between 1994 and 1996. The study at Howick Beach in 1996 reported that pipi *Paphies australis* was the most abundant bivalve with lower densities of cockle

Austrovenus stutchburyi and the wedge shell *Macomona liliana*. Small patches of cockles less than 6 mm in length were in low densities, mostly in the upper tidal areas. The mean length was 20.9 mm in 1995 and 8.9 mm in 1996. The pipi increased in density from 1994 to 1996, but the average length remained about 20mm. Both pipi and cockle were hard to find alive in the current survey.

SPECIES LIST

Mollusc names have been updated to Spencer and Willan (1996) and Marshall and Burch (2000). **Voucher specimens** of the 1950s and 2000 surveys are deposited in the marine collection of the Auckland War Memorial Museum. A few species found at Howick on occasions other than the 1950s or 1999-2000 surveys have been included.

a= abundant, c = common, o = occasional, r = rare, d =dead
* = previous Morley record, A.White = Arthur White collection

	1999 & 2000	A. White 1950's
Chitons		
Acacthochitona zelandica	o	
Chiton glaucus	o	
Cryptoconchus porosus	r	o
Ischnochiton maorianus	o	
Leptochiton inquinatus	o	
Rhyssoplax aerea	r	
Sypharochiton pelliserpentis	c	
Gastropods		
Amalda australis	o	a
Amphibola crenata	d	
Anabathron hedleyi	o	
Austromitra rubiginosa	o	
Buccinulum linea linea	o	c
Buccinulum vittatum	o	c
Bulla quoyii	d	c
Bursatella leachii	a	
Cabestana spengleri		o
Calliostoma pellucidum		o
Cellana ornata	r	c
Chemnitzia errabunda	o	
Chemnitzia verecunda	r	
Chemnitzia bucknilli	o	
Chemnitzia sp.	o	
Cominella adspersa	c	c
Cominella glandiformis	c	c
Cominella maculosa	d	c
Cominella quoyana quoyana	d	c
Cominella virgata	o	c
Cookia sulcata		c
Crepidula costata	c	c
Crepidula monoxyla	o	c
Daphnella cancellata	r	
Dicathais orbita	o	c
Diloma arida	o	
Diloma subrostrata	c	c
Diloma zelandica		c
Eatoniella albocolumella	d	
Eatoniella aterviseralis	r	
Eatoniella limbata	d	
Eatoniella lutea	o	
Eatoniella olivacea	d	
Eatoniella varicolor	p	
Eatonina atomaria	o	
Eatonina micans	p	
Epitonium tenellum	d	o
Eulimella coena	d	
Haminoea zelandiae	o	c
Haustrum haustorium	d	c
Herpetopoma bella		o
Leuconopsis obsoleta	o	
Lepsiella scobina	c	c
Maoricolpus roseus	d	
Marinula filholi	d	o
Melagraphia aethiops	c	c
Melanochlamys cylindrica	r	
Micrelenchus huttonii	d	c
Murexul octogonus		c
Neoguraleus amoenus	d	
Neoguraleus murdochi	d	
Neoguraleus sinclairi		c
Nerita atramentosa	o	c
Nodilittorina antipodum	c	c
Notoacmea elongata	d	c
Notoacmea parviconoidea	o	c
Nozeba emarginata	d	
Onchidella nigricans	c	
Penion sulcatus		c
Physastra variabilis		r
Pisinna olivacea impressa	d	
Pisinna zosterophila	d	
Pusillina hamiltoni	d	
Risellopsis varia	o	
Rissoina chathamensis	d	c
Rostanga muscula	r	
Scutus breviculus		c
Sigapatella novaezelandiae	o	o
Siphonaria australis	o	c
Struthiolaria papulosa	d	c
Struthiolaria vermis		c

Suterilla neozelanica	d	
Taron dubius	o	c
Thoristella oppressa		c
Trichosirius inornatus		c
Trochus tiaratus	d	o
Trochus viridus	d	o
Tugali elegans		o
Tugali suteri	r	o
Turbo smaragdus	c	c
Xymene plebeius	d	c
Zalipais lissa	o	
Zeacolpus pagoda	d	
Zeacumantus lutulentus		c
Zeacumantus subcarinatus	c	
Zegalerus tenuis	d	
Zemitrella choava	d	
Zemitrella pseudomarginata	o	r
Zerotula sp.	r	
Zethalia zelandica	d	
Bivalves		
Anomia trigonopsis	o	c
Arthritica bifurca	d	
Atrina zelandica		c
Austrovenus stutchburyi	o	a
Barnea similis	d	c
Bassina yatei	d	d
Chlamys zelandiae		o
Cleidothaerus albidus		c
Crassostrea gigas	c	
Cyclomactra ovata	d	c
Diplodonta striatula	d	o
Dosina crebra	d	c
Dosinia maoriana	d	
Dosinia subrosea	d	c
Felaniella zelandica	d	o
Gari lineolata		o
Gari stangeri	d	o
Irus reflexus		c
Irus elegans		c
Lasaea hinemoa	d	
Leptomya retiaria	d	c
Limaria orientalis	d	
Macomona liliana	c	c
Melliteryx parva	d	
Modiolarca impacta	d	o
Musculista senhousia	d	
Myadora boltoni	d	o
Myadora striata	d	
Mylitella vivens	d	
Mylitta stowei	d	
Mytilus edulis		o
Neolepton antipodum	o	
Nucula hartvigiana	o	c
Paphies australis	r	c
Paphies subtriangulata	d	
Periploma angasi	d *	d
Perna canaliculus	o	c
Peronaea gaimardi	d	c
Philobrya munita	d	

Pholadidea tridens	d	
Pholadidea suteri		o
Protothaca crassicostata		o
Ruditapes largillierti	d	c
Saccostrea cucullata	?	c
Resania lanceolata		o
Solemya parkinsoni	*	c
Soletellina nitida	d	d
Soletellina siliquens	d	d
Theora lubrica	d	
Venericardia purpurata		o
Xenostrobus pulex	c	c
Zelithophaga truncata	d	c
Zenatia acinaces		r
Scaphopoda		
Antalis nana	d	
Brachiopoda		
Calloria inconspicua		o
Echinoderms		
Allostichaster polyplax	r	
Coscinasterias muricata	r	
Evechinus chloroticus		c
Fellaster zelandica	a	a
Ophionereis fasciata	r	
Patiriella regularis	o	
Crustacea		
Cyclograpus lavauxi	o	
Halicarcinus varius	o	
Hemigrapus crenulatus	c	
Notomithrax minor	r	
Ovalipes catharus	d	
Ozius truncatus	o	
Pagurus novaezelandiae	c	
Petrolisthes elongatus	c	
Pilumnopeus serratifrons	o	
Barnacles		
Austrominius modestus	c	
Balanus trigonus	o	
Chamaesipho columna	c	
Epopella plicata	o	
Notobalanus vestitus	o	
Tetraclitella purpurescens	r	
Polychaetes		
Chaetopterus sp.	o	
Flabelligera affinis	o	
Paraidanthyrsus pennatus	o	
Spirobranchus cariniferus	c	
Salmacina australis	o	
Spionid tubes	c	
Spirorbis sp.	c	
Coelenterates		
Actinia tenebrosa	r	
Actinothoe albocincta	o	
Culicia rubeola	o	
Isactinia olivacea	c	
Oulactis muscosa	r	
Sponges		
purple finger sponge	r	
Tethya aurantium	r	

Tethya australis	r	
Bryozoa		
Beania magellanica	o	
Ascidians		
Aplidium phortax	r	
Asterocarpa coerulea	r	
Corella eumyota	o	
Cnemidocarpa bicornuata	o	
Pyura rugosa	c	
Styela plicata	o	
Fish		
Acanthoclinus fuscus	o	
Tripterygion varium?	r	
Algae		
Carpophyllum maschalocarpum	c	
Carpophyllum plumosum	o	
Codium fragile	o	
Corallina officinalis	c	
Ecklonia radiata	o	
Hormosira banksii	c	
Microcoleus lyngbaeus	o	
Rhizoclonium implexum	a	
Sargassum sinclairii	o	
Scytosiphon lomentaria	o	
Marine angiosperm		
Zostera novozelandica	r	a
Cyanobacterial seaweed		
Lyngbya majuscula	a	

THE 1999-2000 SURVEY

Strong on-shore winds during the public field trip on 27 November prevented observation of low tidal fauna, so a second trip was undertaken on 21 January 2000, when it was fine weather and a spring low tide.

The intertidal area was searched from the splash zone down to low tide. It included the rock platform at the western end, the central sandy area and the rocky headland at the eastern end of the beach. Microscopic molluscs were identified from algal washes, rock washes and gravel under rocks (See species list).

At the time of the survey the intertidal rock platform had a thin layer of silt in the gullies but the surface of the rock was free of silt. Shrimps and unidentified shoals of small

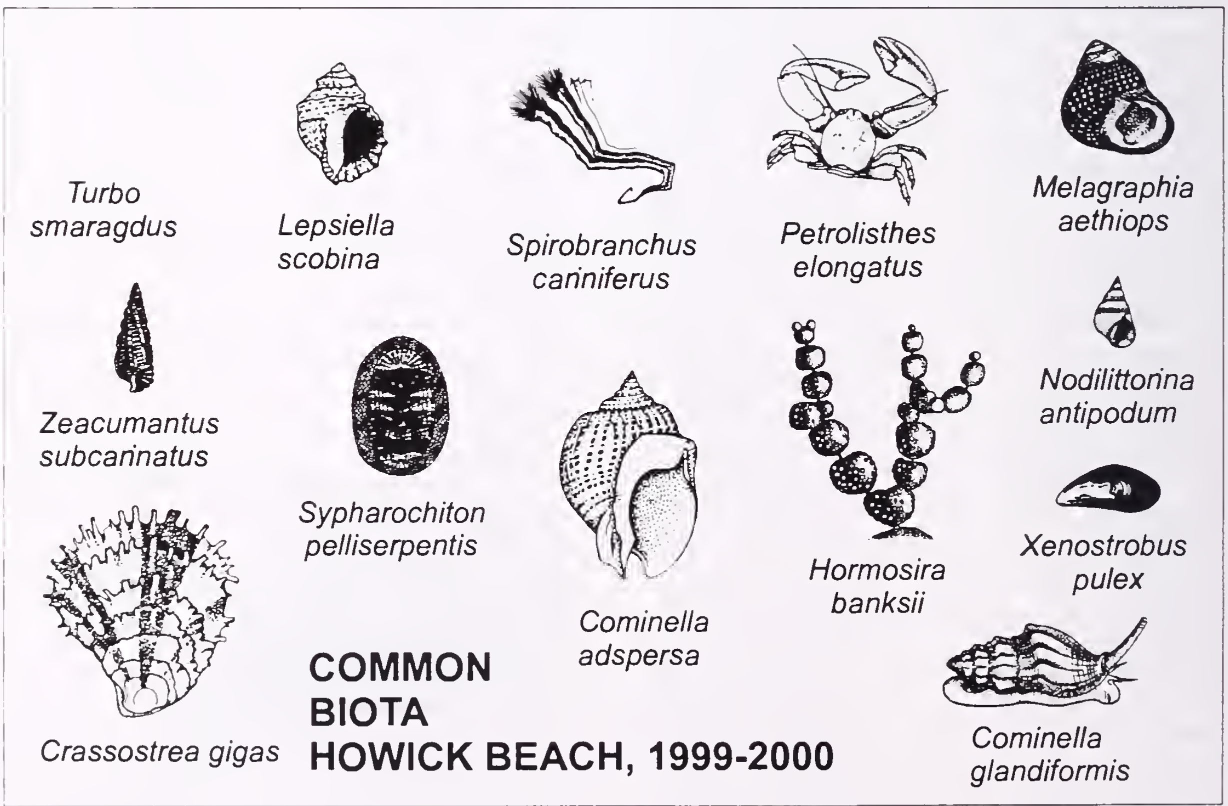

Fig. 2. Common biota at Howick Beach, 1999-2000. Specimens drawn by Margaret Morley, and Powell (1987).

fish were seen in the rock pools and shallow water. A few triplefin fish were living under rocks in pools.

High tide

Mature populations of the topshell *Melagraphia aethiops* (Fig. 2) graze on high tidal rocks on the west side of the beach at the base of the cliff. A few black nerita, *Nerita atramentosa* were spotted under a rocky overhang. Sparse numbers of the small blue and white periwinkle *Nodilittorina antipodum* live on the sandstone rocks, but are common on harder introduced basalt rocks. The latter have been brought in from Rangitoto and placed at the base of the cliff in efforts to reduce erosion by wave action. Large numbers of the little black mussel *Xenostrobus pulex* pack tightly together. The snakeskin chiton *Sypharochiton pelliserpentis* is common (Fig. 2). High tidal crabs *Cyclograpsus lavauxi* live under cobbles.

Mid tide

On the crest of the sandstone ridges are recruitments of the introduced Pacific oyster *Crassostrea gigas* (Fig. 2). This species appeared in New Zealand in the 1970's. Vast populations dominate the intertidal zone in the Manukau Harbour. More recently this species has gradually become established in the Waitemata and the east coast of Northland. It has been present and increasing in numbers at Musick Point, Tamaki Estuary and Mellons Bay, Howick for several years (pers. obs.). This is the first time a large population has been noted at Howick. The oyster borers *Lepsiella scobina* (Fig. 2) hunt in packs preying on acorn barnacles *Austrominius modestus* and the Pacific oyster.

The mud-flat top shell *Diloma subrostrata* usually lives on sand or mud flats often attached to dead shells but at Howick many were on rocks, possibly as a response to the intermittent silt. The purple- mouthed whelk *Cominella glandiformis* is common at mid tide. The horn shell *Zeacumantus subcarinatus* is common across the intertidal rock platform (Fig. 2). The half crab *Petrolisthes elongatus* (Fig. 2) is common under rocks. The calcareous tube worm, *Spirobranchus cariniferus* is present on vertical rock faces and on sandstone ridges.

Neptune's necklace *Hormosira banksii* is common throughout the mid tide rocks. The pink algal turf *Corallina officinalis* is also common in pools and to low tide, but is mostly dulled by silt.

The marks in the sand like a bird's foot indicate that wedge shells *Macomona liliana* live buried in the anaerobic sandy mud. Both pipi *Paphies australis* and cockles *Austrovenus stutchburyi* (Fig. 3) are difficult to find alive (Fig. 3). It is not easy to pin down a single reason for their decline. Eastern Beach was made a ‘No Take’ zone in 1994 which puts harvesting pressure on nearby unprotected beaches but environmental factors probably play an important role. When adult numbers reach a critically low threshold, reproduction may be affected. The edible species at Eastern Beach have not returned to former levels despite the ‘No Take’ protection since 1994 (pers. obs.).

Low tide

A small bright red nudibranch *Rostanga muscula* (Fig. 3) grazes on patches of red sponge and two specimens of a cylindrical black slug *Melanochlamys cylindrica* live on mud in a low tidal pool. This latter species has not been seen here previously. The bulbous spawn and dead shells of the brown bubble shell *Bulla quoyii* indicate adults live nearby.

Speckled whelks *Cominella adspersa* (Fig. 2) were in a group of 20 animals laying eggs under a rock. Smooth slipper shells *Crepidula monoxyla* were attached to numerous cat’s-eye shells *Turbo smaragdus* (Fig. 2). Other marine fauna included several species of sea squirts, marine worms, anemones, hermit crabs and cushion stars *Patiriella regularis*.

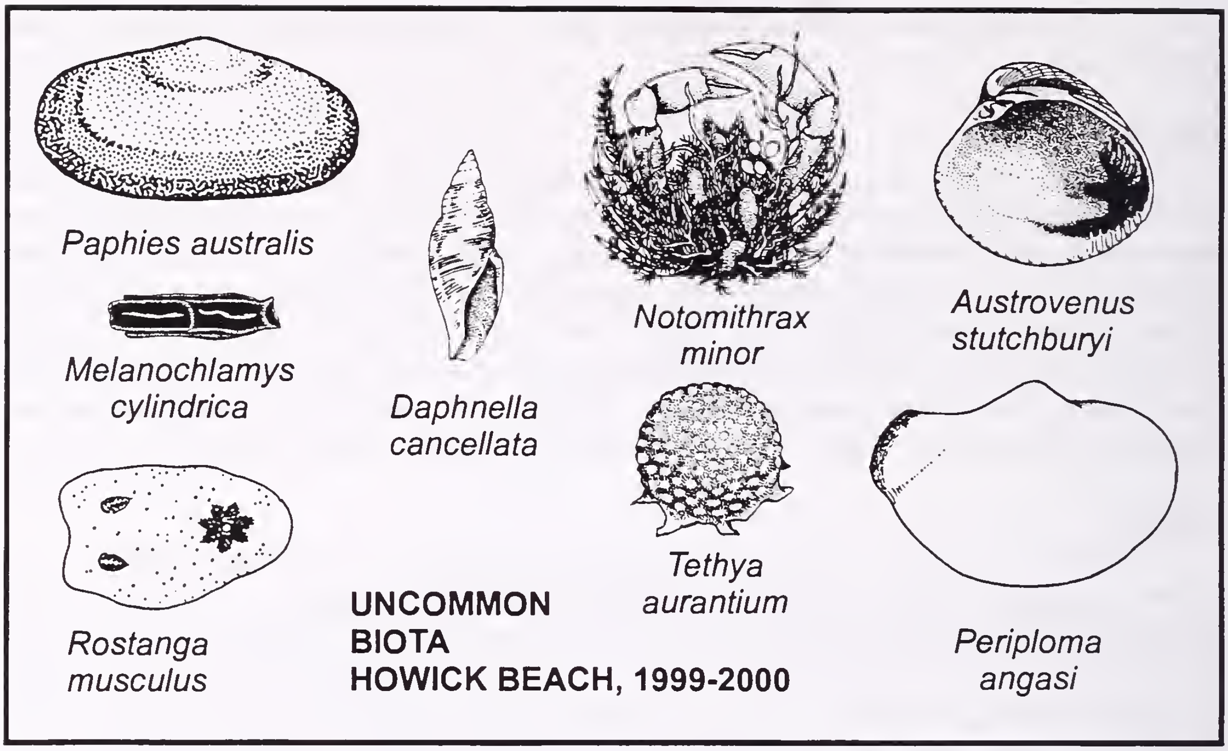

Fig. 3. Uncommon biota at Howick Beach, 1999-2000. Specimens drawn by Margaret Morley, and Powell (1987).

The attractive turrid *Daphnella cancellata* (Fig. 3) was a surprise find living under a rock on mud at extreme low tide. This species is an unusual find intertidally and it is the first time it has been noted at Howick.

A live specimen of *Zemitrella pseudomarginata* was found under a cobble. The body was creamy white speckled with vivid white, sparse tan brown stripes run vertically up the body from the foot. The head was dark grey brown with white tentacles close together and eye spots at the base. There was no operculum.

Brown seaweeds fringe the pools, gullies and rock platform at low tide. Live specimens of the small pyramidellid *Chemnitzia bucknilli* were sieved from the sand around worm holes. A few small live olive shells *Amalda australis* can be found in trails in the sand but before the use of the antifouling paint tributyl tin this species was abundant. Snapper biscuits *Fellaster zelandica* are abundant near the surface of the sand at low tide.

COMPARISON WITH THE 1950'S ARTHUR WHITE COLLECTION

Arthur's collection, made mainly between 1950 and 1959, included specimens from all the beaches in the eastern Auckland area from Musick Point at the mouth of Tamaki Estuary, Howick, Mellons Bay, Cockle Bay to Whitford. It is not always apparent whether he collected a specimen alive or dead but he did comment on the relative abundance of each species. There is only one chiton specimen and no microscopic molluscs.

Species found by Arthur White at Howick Beach but not found in the current survey nor seen in the last 20 years (Fig. 4)

These species are made up of 15 gastropods, 14 bivalves and 1 brachiopod (see species list).

The shield shell *Scutus breviculus* was common at Howick. This species is still frequently encountered living under rocks at low tide around the Waitemata Harbour (Hayward et al. 1999a).

The grooved limpet *Tugali elegans* was found by Arthur at Howick but is not present today. This species is still living under low tidal slabs around the Waitemata Harbour.

The top shell *Calliostoma pellucidum* is rare on reefs in the Waitemata Harbour (Hayward et al 1997a, 1999a). Occasional specimens are seen living on wharf piles and reefs in the Waitemata Harbour and on Motutapu and Waiheke Islands (pers. obs.).

The horn shell *Zeacumantus lutulentus,* usually an abundant species on sheltered sand and mud flats, was not present at Howick in the current survey. Arthur rated it common.

The large ostrich foot *Struthiolaria papulosa* was common in low tidal sand in the 1950s, but only a dead specimen was found in the current survey. Living specimens were present at Eastern Beach and Mellons Bay, Howick until about 1995 but are rare today.

The small ostrich foot *Struthiolaria vermis* was recorded as common by Arthur but was not seen during the current survey. There is a small population living in low tidal coarse sand at Bucklands Beach, Tamaki Estuary. This species is also living in small numbers in similar habitats including mud around the Waitemata Harbour (Hayward et al 1999a).

The small gastropod *Trichosirius inornatus* was common in Arthur's day but has not been found locally since. In the Waitemata Harbour subtidal surveys it is recorded as rare (Hayward et al 1997a).

The Spenglers trumpet *Cabestana spengleri* in Arthur's collection is a mature specimen, 120mm in length. Arthur records this as occasional. This species was found to be rare in the Waitemata Harbour during mapping studies (Hayward et al 1999a). There are populations in the Manukau Harbour, but on the east coast the nearest significant populations of this species are now on the Whangaparaoa Peninsula.

The murex shell *Murexul octogonus* was common at Howick in the 1950's but cannot be found there today. It was present in low numbers at nearby Eastern Beach and Mellons Bay until about 1989 but has disappeared from these beaches more recently (pers. obs.). This species is susceptible to the biocide tributyl tin (TBT) used in antifouling paint. TBT induces imposex which prevents reproduction. Female specimens change to males and males become impotent. Recent studies show that the following species are affected by TBT: *Lepsiella scobina, Haustrum haustorium, Dicathais orbita, Xymene plebeius, Murexul octogonus, Amalda* spp., *Buccinulum* spp. and *Cominella* spp. (Jones 1992, Scott 1993).

Large specimens of the lined whelk *Buccinulum linea,* including the multilinea form, were common in the 1950's, only a few small specimens live Howick in 2000. Similarly the populations of the top shells *Trochus tiaratus* and *T. viridus* have declined to the point where only dead shells can be found.

The whelk *Penion sulcatus* was common in the 1950's. The nearest area where they are still found is Musick Point, Tamaki Estuary (pers. obs.).

The fresh water gastropod *Physastra variabilis* was found rarely in the 1950's. It is not clear whether this was found alive in the stream or as a wash up on the beach. Probably Howick streams with the frequent sewage overflows are too polluted for this species to be living there today.

The blue mussel *Mytilus edulis* was occasional at Howick in the 1950s but not present in 2000. This species is a common southern mussel but small local populations are found today in the North Island on the shores of Motutapu; Waiheke Island, Hauraki Gulf; Kaiarara, Great Barrier Island and the Bay of Islands (MM pers. obs.). Shells may have been dumped at Howick by boaties.

The endemic rock oyster *Saccostrea cucullata* was common in Arthur's day on rocks towards high tide. Today the dominant oyster at Howick is the Pacific species *Crassostrea gigas* which lives on the crest of the sandstone ridges at mid to low tide levels. The shells of the two species are difficult to distinguish on external appearance. Internally *S. cucullata* has a series of denticles alongside the valve margins, whereas this area in *C. gigas* is smooth. To add to the confusion oysters growing on North Shore beaches have some of each species in the same clump (pers. obs.). Research shows that the two species are similar and probably had a common ancestor in the recent past. Under laboratory conditions each will fertilise the other, it is not yet known whether the fertilised spat will grow to maturity (Les Kirton, Ministry of Fisheries pers. comm.).

There are whole specimens of the bivalves *Gari lineolata* and *Cleidothaerus albidus* in Arthur's collection from Howick, but none were found in 2000. Single valves of *G. lineolata* occasionally wash up on Eastern Beach and *C. albidus* lives attached to low tidal rocks at Musick Point, Tamaki Estuary.

The red brachiopod *Calloria inconspicua* was found to be common at Howick in the 1950's, but is no longer present. Specimens are still common under low tidal boulders at Brown's Island and Islington Bay, Rangitoto Island.

Decreased abundance of molluscs from 1950s-2000

One chiton, 24 gastropods and 20 bivalves in the Howick species list show a decrease in abundance from the 1950s to 2000.

The dramatic decrease in the numbers of the olive shell *Amalda australis* from abundant to occasional is probably due mainly to tributyl tin in antifouling paint. The brown and white rock shells *Haustrum haustorium* and *Dicathais orbita* and the oyster borer *Lepsiella scobina* are also susceptible to tributyl tin (Jones 1992, Scott 1993), but the latter two species are still relatively abundant at Howick.

In the 1950s, patches of the eel grass *Zostera,* were present at Howick mostly on the intertidal flats towards the western end of the beach (Wood 1962, John Morton pers. comm.). In the 1950s *Zostera* was decimated by a fungal slime (Armiger 1964, 1965). There has been no *Zostera* on Howick since the early 1960s, until the small patches found recently (pers. obs.). This loss of habitat probably accounts for the reduced numbers of the bivalves *Solemya parkinsoni, Ruditapes largillierti, Nucula hartvigiana* and *Leptomya retiaria,* also the small top shell *Micrelenchus huttonii* and the bubble shells *Haminoea zelandiae* and *Bulla quoyii.* These species are common inhabitants of *Zostera. H. zelandiae* was recorded in densities of 30 per square metre (Wood 1962, Morton and Miller 1986 p.543). *Ruditapes largillierti* is a common species found today in subtidal channels (Hayward 1997a).

The abundant populations of the edible bivalves *A. stutchburyi* and pipi *Paphies australis* have suffered from repeated slurries of silt and sewage overflows in addition to heavy human harvesting.

Several species depend on abundant beds of *A. stutchburyi.* and *P. australis.* They were predated or scavenged by the carnivorous whelks *Cominella adspersa, C. virgata, C. glandiformis* and *C. maculosa. C. maculosa* was common in the 1950's but was not found alive in 2000. *C. adspersa* and *C. glandiformis* are still common on the intertidal rock platform, but their numbers have greatly reduced during the last twenty years on the sandy areas (MM pers. obs.). The wedge shell *Macomona liliana* sucks in surface detritus (Morton and Miller 1986 p.489) which may now be short of organic matter. The large ostrich foot *Struthiolaria papulosa* filters for reduced nutrients at low tide in addition to being gathered for food. *S. papulosa* was common in the 1950's but was only found dead in 2000.

Decrease in size from 1950s to 2000 (Fig. 4)

Most of the specimens in the Arthur White collection in the Howick area are considerably larger than the average sized specimens that can be found at the present time. A few very large single valves of *A. stutchburyi* can be found at Howick, but one suspects that they are remnants of much older generations.

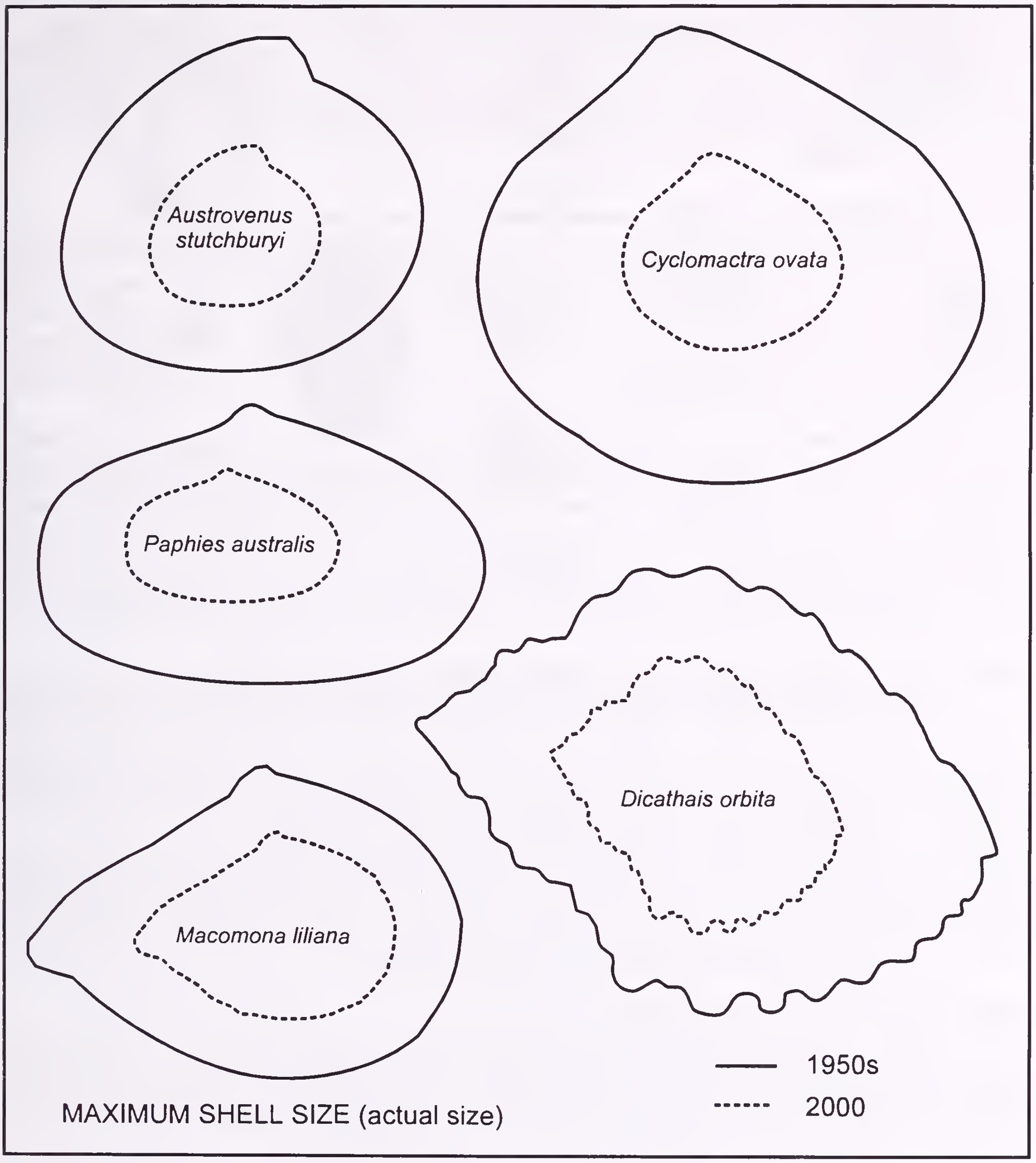

Fig. 4 Diagrammatic comparison of maximum shell sizes 1950s and 2000.

In some cases Arthur's specimens are among the largest seen in any New Zealand collections. The height of Arthur's white rock shell *Dicathais orbita* from Howick is 91mm, from Eastern Beach and Browns Island both 200mm in length. Today the largest specimens found at Howick and the surrounding area are 45mm in height.

A specimen of *Austrovenus stutchburyi* from Howick in 1953 is 57mm in length. Today it is hard to find any live specimens and the maximum length is only 28mm (Fig. 4). No live pipi *Paphies australis* were found in the current survey, although storms in July 2000 washed in double valves in moderate numbers. It was encouraging to see that these represent two cohorts with specimens averaging 27mm in length and a second with specimens averaging 10 mm. The only valves over 33mm in length were very old and worn. In Arthur's day the largest specimens were 60-70mm in length and he rated *P. australis* as abundant.

The largest wedge shell *Macomona liliana* shows a decrease in size between 1950's and 2000 from 68 to 40mm in length. Three other bivalves to show a marked decrease in size are the oblong venus *Ruditapes largillierti,* the fine biscuit shell *Dosinia subrosea,* and the trough shell *Cyclomactra ovata* (Fig. 4).

Species found by Arthur White around Howick, but not found in 2000 (Fig. 5)

These are the turrid *Phenatoma zelandica* and teredo *Bankia australis* at Mellons Bay, *Sinuginella pygmaea* at Musick Point and Browns Island, the volute *Alcithoe arabica,* yellow *Lamellaria ophione, Paratrophon* sp., deep burrower *Panopea zelandica,* lace cockle *Divaricella huttoniana* and *Myadora boltoni* at Eastern Beach, the scallop *Pecten novaezelandiae* at Mangemangeroa Estuary, Whitford, and Cockle Bay and the small ostrich foot *Struthiolaria vermis* at Little Bucklands Beach.

Arthur comments on the thousands of brachiopods *Calloria inconspicua* and common Cooks turban -*Cookia sulcata* at Browns Island, massive wash-ups of the fan mussel *Atrina zelandica* in the Tamaki Estuary. *Atrina* are found living today at and below low tide at Karaka Bay, Tamaki Estuary Heads, but no massive wash-ups have occurred in recent years. Brachiopods are still living at Browns Island. He mentions numerous red shore crabs, hairy crabs, sea urchins, heart urchins and kina in the Howick area (A. White lecture notes).

Mollusc species found in this survey but not collected by Arthur White

Most obvious of these are the four introduced bivalves which have arrived since the 1950s, *Musculista senhousia, Limaria orientalis, Theora lubrica* and *Crassostrea gigas.* Only dead specimens of *T. lubrica* and *M. senhousia* were found but there are large intermittent populations of both species in low tidal mud in the Tamaki Estuary. *L. orientalis* is common to abundant subtidally in the Waitemata Harbour (Hayward et al 1997).

The White collection is extensive, however some specimens could not be included because of label damage. In some cases the writing had been entirely eaten by silverfish. He was not doing a survey so may have omitted some species that were present. He did not collect chitons, soft bodied animals or microscopic specimens.

Species found previously in the Howick area

A large undamaged specimen and several valves of the lantern shell *Periploma angasi* (Fig. 3) washed in at Howick during the development of Pine Harbour marina, Beachlands in 1986-87. The pyramidellid *Linopyrga rugata* and the small bivalve *Scintillona zelandica* have both been found at nearby Bucklands Beach and Eastern Beach.

ALGAL BLOOM

During the autumn months from March to July 2000 there was a widespread algal bloom at beaches from Beachlands to the Tamaki Estuary and on North Shore beaches as far north as Long Bay. The dense algal populations were attached to intertidal rocks in pools, ledges and on flat rock platform surfaces sometimes growing on top of *Corallina officinalis, Hormosira banksii* and *Carpophyllum maschalocarpum.* The algae causing the bloom was

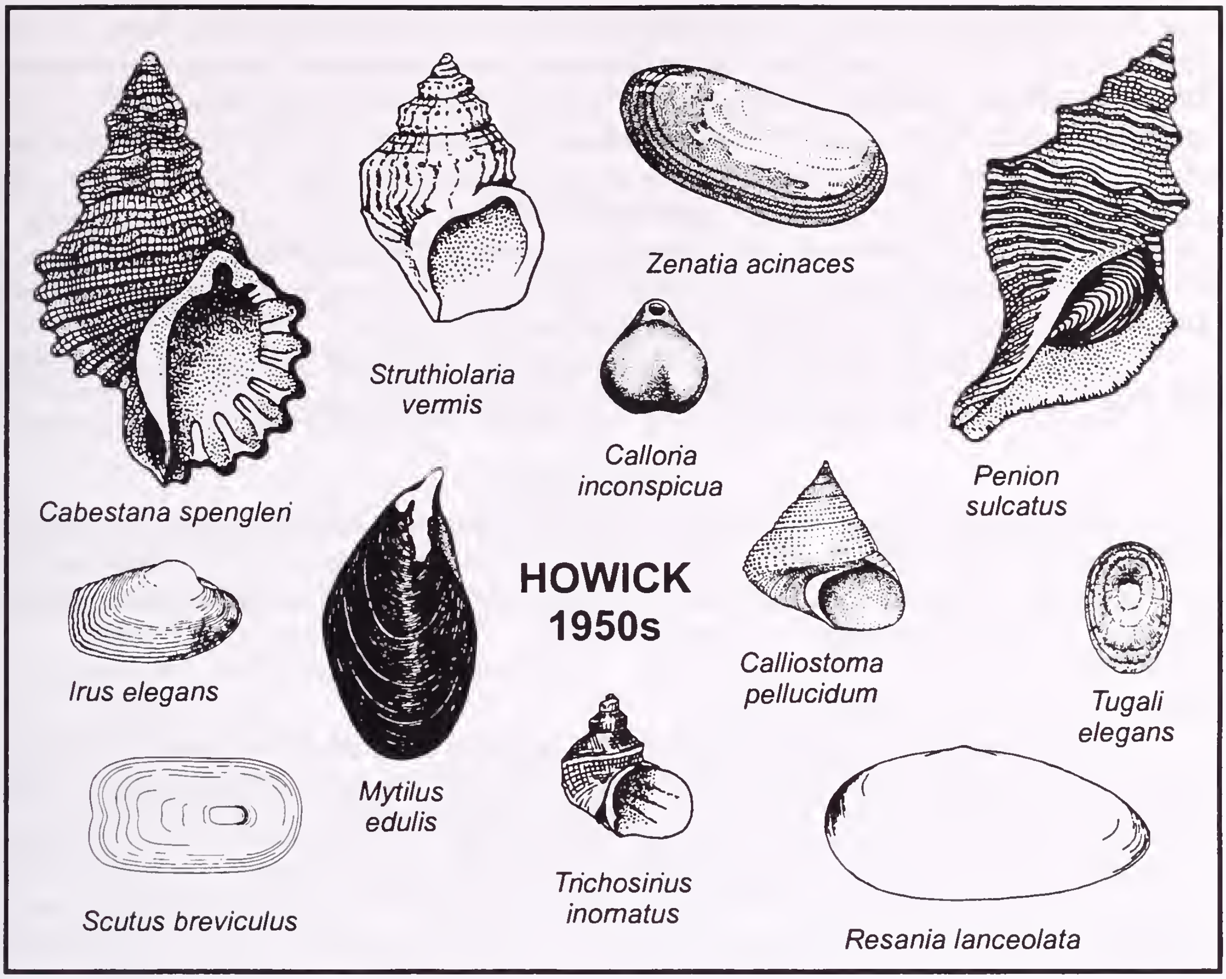

Fig. 5 Species found at Howick by Arthur White in the 1950s, and not present for the last 20 years. Specimens drawn by Margaret Morley, and Powell (1987).

identified by Doug Rogan, the botany technician at Auckland War Memorial Museum, as a 50/50 mix of *Rhizoclonium implexum* and a blue green seaweed Cyanobacteria.

Shortly afterwards the sea hare *Bursatella leachii* became abundant intertidally, exploiting this bountiful food source. Some of the specimens measured 137mm in length, far exceeding the maximum length of 120mm given by Powell (1979). Among the foul smelling drifts of algae up to 30cm deep were numerous dead *B. leachii* and their spawn, like discarded tangles of green knitting. *B. leachii* die after spawning (Morton and Miller 1968).

Experts do not agree on the cause of the bloom which has not been noted by residents in the affected areas previously. They surely could not have missed the smell! Is it a natural phenomena, a result of increased nutrients due to human activities, or due to warmer than average temperatures? A similar algal bloom occurred at Blackpool and Whakanewha on the southern coast of Waiheke Island in March 1999 (pers. obs.).

ZOSTERA

In the 1940s and 1950s there used to be extensive areas of the sea grass *Zostera* at low tide, sea horses and piper were common (Alan La Roche pers. comm.). Following a fungal disease in the 1950's (Armiger 1964, 1965) the sea grass apparently disappeared from the whole of the Waitemata Harbour. Its regrowth has been recorded in Coxs Creek, upper Waitemata Harbour (Hayward et al. 1999b).

Zostera is important in stabilising silt and for providing habitat for molluscs, worms, crustacea and other invertebrates. Teeming numbers of rissoid snails have been recorded on *Zostera* leaves. A square metre at low water yielded 5000 specimens each of the microgastropods *Pisinna zosterophila* and *Eatoniella limbata*. In the 1950s the nut shell *Nucula harvigiana* was found at Howick with up to 1800 specimens in a square metre. The razor mussel *Solemya parkinsoni* was living buried in the *Zostera* flats at Howick in concentrations of 80 per square metre (Morton and Miller 1968, p.543). It is common in *Zostera* in Parengarenga Harbour (pers. obs.). In the current survey at Howick these species are only represented by low numbers of dead specimens.

Small patches of *Zostera* are now growing near low tide at Howick Beach. If these become established, populations of the associated fauna may also reappear.

DISCUSSION

The molluscs at Howick Beach show severe decreases in abundance, diversity and size between 1950's and 2000. It appears that the main causes are loss of habitat, siltation, TBT and harvesting. These changes are similar to those in the wider Waitemata Harbour which are discussed in detail by Hayward et al.(1997a, 1999a).

Pressures of an increasing population

The increasing Auckland population puts ongoing pressure on the marine life in the harbour. Some progress has been made to address this problem, such as the Task force in the Tamaki Estuary which works hard to reduce pollution and educate the staff of industries on the margins of the estuary. New subdivisions or developments are required to have silt traps to reduce sediment pouring into the sea. If the recent proposal to create a settlement pond at Howick for road run-off is implemented, the water quality entering the sea will improve. In 1989 TBT was banned on small boats.

Need for increased protection

Despite dedicated enforcement officers the ‘No Take’ beaches are still targeted by poachers and adjacent beaches are subject to increased harvesting pressure. Is it time for the Ministry of Fisheries to make an overall harvesting (or nil harvesting) plan for the greater Auckland area, both east and west coasts? The current daily limits are not achieving sufficient protection. It is interesting to note that even in the 1950s Arthur was concerned at the large amounts of shellfish being removed for food.

The threat of reclamation

Nearly half of the natural shoreline of the central Waitemata Harbour has been modified physically (Hayward et al 1997a p21). The reclamation of the intertidal platform at the west end of Howick Beach would add yet one more strip of coast totally modified for man's use. The proposed ferry terminal with all its attendant buildings, access way and carpark would necessitate a large reclaimed area. The richest marine habitat would be eliminated and man-made structures would dominate the beach. While it no longer has the wealth of sea life Arthur enjoyed, it still has recreational value for future generations. Commercial interests are already well provided for at Halfmoon Bay in the Tamaki Estuary.

While the shore platform still remains there is a chance at cleaning up the environs and restoration of the biota - once reclaimed it can never be returned. Despite the severe depletion of the intertidal biota in recent years the western shore platform still supports the most interesting and diverse fauna at Howick Beach, especially at low tidal level out off the point.

Some aspects of the interdependence of marine life are poorly understood. We are in danger of destroying them even before proper studies are completed.

These problems can be summed up by the remark "Everybody who wants to know who the villain is should go and look in the mirror".

ACKNOWLEDGEMENTS

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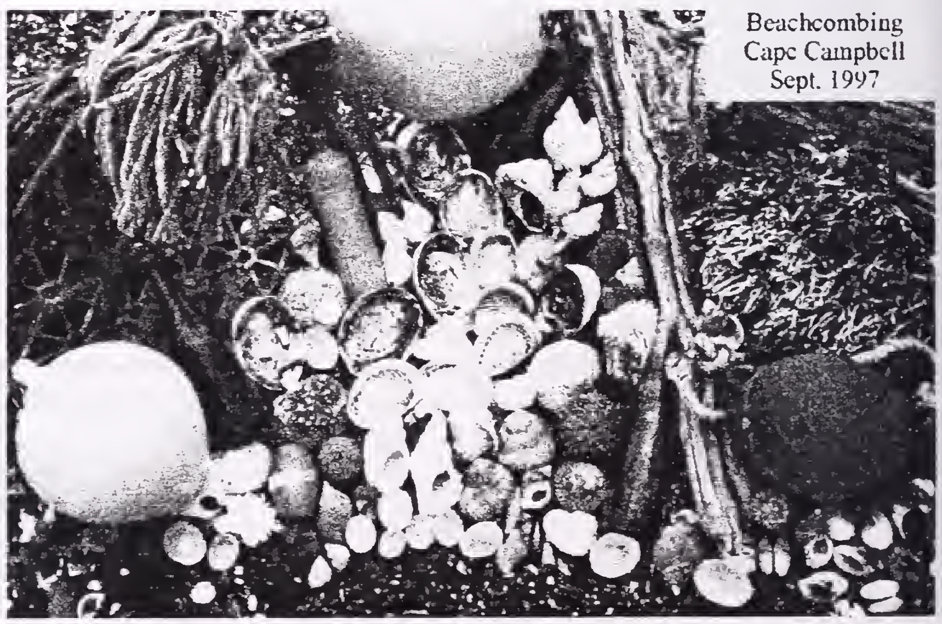
MARFELLS BEACH and CAPE CAMPBELL
by Bev Elliott

My first visit to Marfells Beach, North Eastern Marlborough, was over 40 years ago when I was a teenager. In those days, large quantities of Cantharidus opalus & purpureus, Argobuccinum tumidum & Modelia granosa washed ashore there, but it's too long ago to remember much about it. Throughout the years I've gone back from time to time, and the wide variety of shells there prompted me to make a separate collection, which has now been extended to include Cape Campbell, and comprises over 150 species.

Cape Campbell is 2 hours walk from Marfells Beach. But much of the way is past sheer cliffs, and to do it as a day trip means going flat out to beat the tide, which could cause a severe predicament if one were cut off. My first visit there was 25th August 1972, the date taken from the Postmark I obtained at the time. Postmark collecting was a grand hobby back in those days, resulting in a thorough knowledge of NZ geography, and visits to out-of-the-way places. Unfortunately with the closing of most of our Post Offices, all that is a thing of the past. Cape Campbell, bleak and barren and now deserted, 30 years ago had its Lighthouse Keeper and his family, and even a Post Office. My second visit, in Sept 1989, was just as brief. I had just begun the wonderful hobby of photography, and wanted a photo of Cape Campbell Lighthouse. Several hours of fast tramping in the rain resulted in one grey and unattractive photo, and a hasty retreat before the tide cut me off. Better planning was called for an overnight trip with tent and sleeping bag, and plenty of time for leisurely exploring and collecting. March 1990 turned on a typical Cape Campbell howling gale, but at least I did have more time to enjoy(?) it. I was amused at a lone Macrocarpa tree 3 to 4 metres high, and about 14 metres long, trying to solve the wind problem by growing along, instead of up!

In March 1993 at last I struck a fine day with clear blue skies and lovely photos of the Lighthouse reflected in tidal pools. The Lighthouse was established in 1870, and the 22 metre tower built in 1905. It has a light range of 27 miles.

I was back there again in September 1997; this time my main aim was to walk South to Boo Boo Stream. In doing that, I had over the years walked a 55k length of coastline from Ure River to Wairau Lagoon. The Boo Boo wasn't even worth a photo; however, by the time I arrived back at my tent I was laden with floats and shells and various bits and pieces which made a nice photo. The big green float with "Challenger" painted on it, which I carried for so many miles, turned out to have floated all the way up from Kaikoura, and ended up back with its owner after its long voyage. On this trip I was surprised to meet a lady with two small boys, and she was equally surprised to see me. Not many folk visit Cape Campbell, but the owners do have private 4WD roads



Beachcombing
Cape Campbell
Sept. 1997

over their farm, and a bach near the Lighthouse where they sometimes stay. Sally showed me photos of a giant Architeuthis with 5 metre tentacles that had washed ashore there. She took me in the 4WD to the top of Mt Tako, 638 ft, where there are Wartime remains, including part of an old Radar Station. And she told me of the Sea Elephant which was born at Cape Campbell one November, and comes back to visit her birth place each year. Yes, I did remember an encounter with her on one of my earlier visits, in which she moved her great bulk with surprising speed, to chase me off "her" beach!! A few Fur Seals live on the coastline here, but much prefer rocky areas elsewhere, to the sandy/shingly beaches of Cape Campbell. And on one visit to Marfells Beach there was a big Sea Leopard at my favourite shelling area. Not realising how dangerous these animals can be, I thought that if I ignored it, it would ignore me, and fortunately that is what it did, as I continued shelling all around it!!

Some shells grow to larger-than-usual sizes at this North-Eastern tip of the South Island. Haliotis iris to 160mm, Haliotis australis to 110mm, Cabestana spengleri to 130mm, Argobuccinum to 100mm, Cookia to 110mm, Modelia granosa to 90mm, Protothaca to 60mm, Mactra discors to 100mm, Cellana flava to 70mm. Among the many common species, two rare ones used to be reasonably common at Marfells Beach, Lamellaria cerebroides and Globisinum drewi. This is the only place I have ever found Globisinum, and once I found nine in one afternoon, in September 1986, in various stages of being battered, unfortunately, but one wonders how these fragile shells manage to survive at all in this exposed area.

My latest trip, in September 2000, was dominated by another Cape Campbell howling gale, and produced very little extra for my collection.

SPECIES LIST - Marfells Beach / Cape Campbell

UNIVALVES	
Haliotis iris	Maoricolpus roseus
Haliotis australis	Sigapatella novaezelandiae
Haliotis virginea	Zegalerus tenuis
Emarginula striatula	Maoricrypta monoxyla
Tugali elegans	Struthiolaria papulosa
Scutus breviculus	Struthiolaria vermis
Patelloidea corticata	Lamellaria cerebroides
Radiacmea inconspicua	Tanea zelandica
Notoacmea daedala	Globisinum drewi
Notoacmea parviconoidea	Xenophalium pyrum
Notoacmea pileopsis sturnus	Cabestana spengleri
Cellana radians	Charonia capax
Cellana flava	Argobuccinum tumidum
Cellana ornata	Mayena australasia
Cellana denticulata	Zeatrophon ambiguus
Trochus tiaratus	Axymene corticatus
Trochus viridis	Thais orbita
Melagraphia aethiops	Haustum haustorium
Zediloma arida	Lepsiella scobina
Cavodiloma coracina	Lepsithais lacunosus
Cantharidus opalus	Zemitrella chaova
Cantharidus purpureus	Buccinulum pallidum (large white)
Micrelenchus sanguineus	Buccinulum "lineum" (large striped)
Micrelenchus tenebrosus	Buccinulum littorinoides (small plain blue/grey)
Cantharidella tesselata	Penion mandarina
Maurea punctulata	Austrofusus glans
Maurea pellucida	Cominella maculosa
Maurea tigris	Cominella adspersa
Maures waikanae	Amalda australis
Lunella smaragda	Alcithoe arabica
Modelia granosa	Neoguraleus
Astrea heliotropium	Onchidella
Cookia sulcata	Archidoris wellingtonensis

Melarapha cincta	Dendrodoris citrina
Melarapha oliveri	Siphonaria zelandica
Risellopsis varia	Siphonaria propria
Rissoina chathamensis	Benhamina obliquata
BIVALVES	
Solemya parkinsoni	Notocallista multistriata
Barbatia novaezelandiae	Dosina zelandica
Glycymeris laticostata	Tawera spissa
Perna canaliculus	Bassina yatei
Mytilus (Blue Mussel)	Notopaphia elegans
Aulacomya maoriana	Notirus reflexus
Modiolus areolatus	Paphirus largillierti
Modiolus (little black mussel)	Protothaca crassicosta
Ryenella impacta	Angulus gaimardi
Zelithophaga truncata	Zearcopagia disculus
Atrina zelandica	Leptomya retiaria
Pecten novaezelandiae	Gari lineolata
Chlamys dieffenbachi	Gari convexa
Chlamys gemmulata	Gari stangeri
Chlamys zeelandona	Soletellina nitida
Pallium convexum	Mactra discors
Limatula maoria	Mactra murchisoni
Monia zelandica	Spisula aequilateralis
Ostrea lutaria	Longimactra elongata
Cardita aoteana	Zenatia acinaces
Venericardia purpurata	Maorimactra ordinaria
Diplodonta striatula	Amphidesma forsterianum
Divaricella huttoniana	Amphidesma subtriangulatum
Nemocardium pulchellum	Panopea zelandica
Dosinia anus	Anchomasa similis
Dosinia maoriana	Pholadidea spathulata
Dosinia subrosea	Cleidothaerus maorianus
CHITONS	
Ischnochiton maorianus	Anthochiton aereus
Cryptoconchus porosus	Amaurochiton glaucus
Acanthochiton zelandicus	Sypharochiton pelliserpentis
Notoplax violacea	Frembleyia egregia
Onithochiton neglectus	
CEPHALOPODA	
Octopus maorum	Spirula spirula
LAND & FRESHWATER - No self-respecting land or freshwater shell would want to live in this dry barren windswept area, or in the few tiny bits of stagnant water. Nevertheless, a few hardy mollusca do live here.	
Therasia thaisa	Potomopyrgus antipoda
Helicella caperata	Planorbis corinna
Helix aspersa	Simlimnaea tomentosa
LAKE GRASSMERE - Nearby Lake Grassmere is the home of Marlborough's Salt Works. In less salty times in the past, a few esturine species lived here. I have found traces of Choine stutchburyi. An old Chione valve measures 79mm. A bucketful of those would have made a good meal!	
Zediloma subrostrata	Chione stutchburyi
Zethalia zelandica	Macomona liliana
Zeacumantus subcarinatus	Mactra ovata
Amphibola crenata	Amphidesma australe
Nucula hartvigiana	

Scientific Paper Summaries

by Peter Poortman

This article contains brief summaries of a selection of scientific papers that have been published in recent years. Copies of the original publications are held in the club library, or can be obtained from the author of the paper.

Firstly, corrections to my summary of "**A Revision of the Recent Calliostoma Species of New Zealand**" in the previous Poirieria magazine.
Selastele, *Fautrix*, and *Bathyfautor* were actually introduced as genera, not subgenera of *Calliostoma*. Also, although not mentioned by name in the New Caledonia paper, *C. kopua and C. limatulum* actually belong in the genus *Selastele* of which *onustum* is the type species.

Title: **Olividae**

Author: Mike Hart
(World Shells, Vol 13, 1995, Pg 82-88)

This paper reviews the New Zealand representatives of the Genus Amalda (IE, *A. australis, A. depressa, A. bathamae, A. mucronata, & A. novaezelandiae*). A new species, *Amalda northlandica*, is described, and *Amalda benthicola* Dell, 1956 is elevated from subspecies to full species status. A description of *Amalda raoulensis* Powell, 1967 is also given as this species has been dredged at a depth of 100m on the Colville Ridge just off the North Island. All species are described in detail and well illustrated.

***Amalda (Gracilispira) northlandica* n.sp.**
Solid shell up to 17mm in length. More inflated than *A. novaezelandiae*, but narrower than *A. depressa*. Distinctive colouration of a broad central dark brown band on a cream/yellow background. The basal groove is white with the upper fasciolar band dark chocolate brown. The rest of the fasciolar area is white. Distribution from Karikari Peninsula to the Mercury Islands, in coarse sand among rocks at depths of 7-10m.

***Amalda (Gracilispira) benthicola* Dell, 1956**
Solid cylindrical shell up to 28.1mm in length. Heavily callused on the upper whorls, but with a protruding apex. The entire shell is cream coloured apart from a pale greenish brown body whorl and slightly incised darker brown ancilid and fasciolar grooves. Fresh shells are reddish in colour but fade to white. Found at depths of 380-600m from the Chatham Rise to the Auckland Islands.

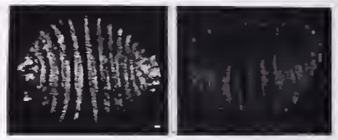
***Amalda (Baryspira) raoulensis* Powell, 1967**
Shell to 56mm in length, solid and ovate with a low spire. The suture is completely covered with callus which is particularly thick ventrally. Protoconch is white, and the spire is banded with different shades of dark brown and orange. The broad body whorl is almost equally divided by a chocolate upper band and lower white band. Below this and immediately above the anterior fasciole is a narrow brownish-orange band. The columella pillar is white. Deep water distribution from the Kermadec Islands to the Colville Ridge just off the North Is.

Title: **New species of Trivia and Erato (Gastropoda: Triviidae) from Northern New Zealand waters**

Author: Michael R. Hart
(La Conchiglia, Year XXVIII, No 279, April/June 1996)

This paper describes two new Recent species of Triviidae. Although several species of Trivia and Erato are known from the New Zealand fossil record, only two Recent species of Trivia were previously recorded. These two existing species, *Trivia merces* Iredale 1931 and *Trivia oryza* Lamarck 1810, are known from shallow water around northern and north-eastern NZ, while the two new species are recorded from very deep water in the same regions.

Trivia valerieae **n.sp.**
Shell almost spherical in shape, ranging from 11.9-15.0 mm in length. Distinctively sculptured with widely spaced, continuous, transverse ribs. Fresh shells are milky white in colour. All specimens were dredged dead off northern NZ at depths of 356-1000m.



Erato tetatua **n.sp.**
Shell bulbous, inflated, pyriform ranging from 10.9-11.3mm in length. Mature shells lightweight and semi-translucent. The milky-white dorsum is smooth and highly glossed with very fine spiral striae at shoulder and base. All specimens were dredged dead on the Three Kings Ridge at depths of 590-640m.

Title: **Description of a New Species of Genus Alcithoe (Volutidae)**

Author: Michael R. Hart
(La Conchiglia 30(292): Pg 56-60,63)

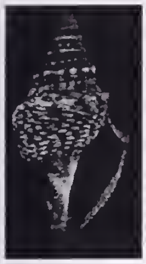
This paper describes a new species of Alcithoe that is known only from Spirits Bay, from a depth of about 43m. The taxonomy of Alcithoe from northern NZ is a difficult subject, and there have been conflicting opinions on the classification of *A. fusus, A. haurakiensis*, and *A. hedleyi*, all of which bear a resemblence to the new species.

Alcithoe davegibbsi **n.sp.**
Shell up to 60mm in length, heavy, ovate, and with a thick and smooth outer lip. Base colour reddish tan overlaid with zigzag dark brown parallel markings with 3 darker oblique broad bands just visible on the body whorl.
Shell shape differs from *A. fusus, A. haurakiensis*, and *A. hedleyi* in being more broad/squat in shape, and in having less prominent axial development and a larger protoconch.

Specimens possibly attributable to *A. davegibbsi* have also been found at Ranfurly Bank, East Cape.

Title: **Occurence of the tropical and subtropical gastropod *Strombus vomer vomer* (Roding, 1798) (Mollusca: Strombidae) off north-eastern Northland, New Zealand**

Author: Bruce A. Marshall and Derrick D. Crosby
(New Zealand Journal of Marine and Freshwater Research, 1998, Vol. 32: 135-137)



This paper records the finding of a fresh juvenile shell of *Strombus vomer vomer* (Roding, 1798) at a depth of 22 m off Berghan Point, north-eastern North Island, in March 1997. This is the first record of a Recent Strombidae species from New Zealand, however a fossil species of *Rimella* is recorded from the Middle Eocene.

Juvenile New Zealand specimen, shown life-size.

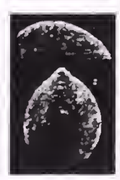
Strombus vomer vomer has an extremely wide and unusually patchy tropical and subtropical distribution. It is uncommon, and has only been reliably recorded from the Ryukyu Islands, Queensland. Compared with other specimens from throughout its geographic range, the New Zealand specimen most closely resembles the form living off New Caledonia, Norfolk Island, and Raoul Island Kermadec Islands.

S. v. vomer joins a number of characteristically tropical and subtropical molluscs that have been recorded intermittently from the north-eastern North Island. Although there are very few records of these species from the waters of mainland New Zealand, they have probably occured here sporadically throughout the Pleistocene period. The larvae of these species live for long periods in surface or near-surface plankton, and evidently drift here during favourable climatic periods. It is extremely unlikely that these species actually breed here, however the authors regard all of the naturally occuring species as elements of the New Zealand biota.

Adult specimen from the Kermadec Islands, shown 3/4 size.

Title: **A new monoplacophoran (Mollusca) from southern New Zealand.**

Author: Bruce A. Marshall
(Molluscan Research 19(1): 53-58 (1998))



This paper describes a new species of monoplacophoran. Six specimens of *Micropilina rakiura* n.sp. were found in October 1994 living on a clump of dead, manganese encrusted, branching coral dredged from 896-1038m south of Puysegur Point, Southland. Shell is up to 1.25mm long, thin and fragile.

A single shell of *Micropilina tangaroa* Marshall, 1990 from the northern Three Kings Rise is the only other Recent monoplacophoran known from the entire western Pacific, and there are now 24 species of this class recorded worldwide.

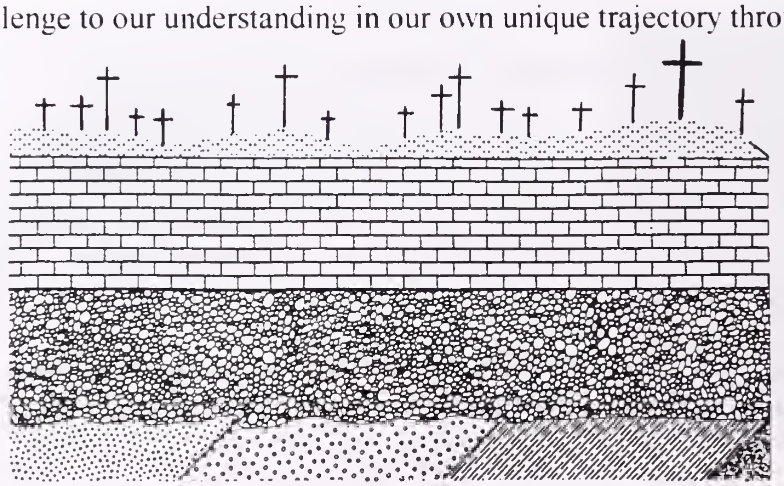
COSMIC CONVULSIONS

Michael K. Eagle

The crust of the earth is a great cemetery where the rocks are tombstones on which the buried dead have written their own epitaphs. All too often the fossil record is one of violent and sudden death; the time and place of a catastrophic event evident perhaps by a change in sediment composition, burial mode, or mass mortality. Nineteenth century European paleontologists explained away such occurrences as "cosmic convulsions"; celestial events that periodically touched the earth causing cataclysmic shoals of death. These vast shoals of animal carcasses and skeletons piled up in every corner of the world, including New Zealand, manifest themselves today as reefs, shellbeds, castbeds, and commonly as limestones. Such burial grounds are usually the result of sediment flowing down a slope, burial by volcanic debris, storm damage or strandings, natural attrition over time, or where non-deposition of sediment allows for extensive accumulation of remains.

New Zealand limestones are the deathbeds of the inhabitants of shallow, marine seas that covered parts of present-day New Zealand during the Ordovician, Jurassic, Eocene, and Oligocene periods. Today, white limestones are effective winding sheets that wrap a representative sample of the molluscan corpses in a ghostly, unsung requiem of deathly deposition. Paleoclimatic conditions have caused the demise of many species, but because of the long-term nature of climatic change, have rarely been the cause of mass mortality. Mass molluscan poisonings caused by toxic phytoplankton, such as that which occurred along the upper section of the North Island's west coast in 1998-99, must have similarly occurred in the fossil record.

Tombstones of the dead do not only manifest themselves in fossilised form. In the far north, in the sand dunes bordering Te Paki Stream, is an exhumed holey citadel. Partially buried and dipping northward, it is a substantial block of cream/light-brown, coarse sandstone riddled with burrows ranging from 15 to 20 cm dia. rising out of the Holocene dunes. At one time it would have been an extensive hive of infaunal activity and home to a multitude of crustacea (probably crabs like *Helice crassa* and *Macrophthalmus hirtipes*) in a subtidal estuary. The eroded form of the blocks complete with a flat tidal surface uppermost, contain evidence of the final demise of a paleometropolis, now a derelict infilled maze of bioturbation, devoid of fossil residents. Did some catastrophic event, occur in the colony prior to uplift and decay, preserving the domicile but precluding preservation of a single resident? Or did a progressive change of habitat over time deliver a hostile environment, causing natural attrition of the occupants? The headstone reveals little. We may never know the actual cause of many "cosmic convulsions". Our contemplative minds, infused with paleontological fact and clues are all we have to unravel the past. There is little doubt that death occurs on a grand scale every day. The silence of the layers are a challenge to our understanding in our own unique trajectory through time.



AUCKLAND MUSEUM CONCHOLOGY CLUB BULLETIN No. 2

by Peter Poortman

In 1930 our club was founded as a boys club by Dr A.W.B. Powell, and from 1935 it functioned as a club for both adults and juniors.
In 1940 the club published the first of what were to be annual bulletins. Bulletin No. 1 mostly contained a list of additions and alterations to the molluscan checklist contained in Dr. Powells book "The Shellfish of New Zealand".
World War 2 then disrupted the clubs' activities, and Bulletin No. 2 was not published until December 1946. This publication, with a large number of contributions from club members, provided an interesting glimpse of life in the 1940's, and in particular the hardships faced by our pioneering club members.
Cars boats and planes were fairly primitive fifty-five years ago. There was no Harbour Bridge, and the roading network was a shadow of what it is today.
So the next time you are cruising in air-conditioned comfort to Spirits Bay, riding the fast ferry to Great Barrier Island, or simply doing some quiet collecting on a local beach, spare a thought for our fellow collectors of long ago.
The following are excerpts from Bulletin No. 2;

PREFACE: **E.N.HOUGHTON**

Owing to the fact that many of our members departed overseas in the forces, while others became engaged in wartime duties at home, all official club activities were cancelled for the duration of hostilities and the intention in 1940 of publishing a bulletin each year was not realised.

Meetings were resumed in May 1945, with a membership of 50, including a number of corresponding members in all parts of New Zealand.

Due largely to the efforts of Mr.E.S.Richardson the Club decided this year to publish Bulletin No. 2 to be made up of articles and notes of interest contributed by Club Members. As the great majority are quite unused to such writing the Committee greatly appreciates the efforts of everyone who has made an attempt and so enabled us to publish a Bulletin once more. It was decided that in view of the great difficulty in getting printing done and the high costs involved the Bulletin this year would be in folio form with cyclostyled sheets.

We wish to thank Mr.A.W.B.Powell, who read and checked the articles, also Mr.T.V.Stein, who gave us invaluable help by printing the folios for us and obtaining the paper which is in such short supply. Our thanks are due to our Chairman, Mr.F.W.Short and Miss G. Miller without whose help in cutting and cyclostyling the stencils, this Bulletin could not have been printed.

A COLLECTING TRIP TO THE FAR NORTH OF NEW ZEALAND: **E.T.B. WORTHY**

As I have always been interested in collecting shells, not that I am a collector myself, but for the fact that my wife is a keen conchologist and my "finds" are always acceptable to her. I offered to drive my two friends Messrs A.W.B.Powell and A.C.O'Connor to the far north when they told me that they were unable to get transport for this trip of theirs.

The trip was planned for a fortnight and as we would be miles away from any shops etc. all food (for this trip) was taken with us besides the necessary camping gear. So it was a well laden car that left Auckland on the morning of 22nd February 1946, on the long trip north.

The first stop was Kaeo, 200 miles north of Auckland, and as we arrived early my two friends spent an hour or two in a nearby patch of bush, returning with a fair catch of "Paryphanta busbyi" and "Rhytida dunniae".

Next morning saw us away to an early start and Awanui was reached before lunch. From then on the roads deteriorated in their surface and one had to exercise care to avoid pot holes and patches of sand. After passing Te Keo, 70 miles north of Awanui the roads for the rest of the trip were unmetalled, but their surface was fair and we finally made our goal for the day at the residence of Mr. Watt on the shores of Parengarenga Harbour. He had been advised of our pending arrival and had made arrangements for transport to Spirits Bay with the Maoris at Te Hapua which is on the opposite side of the harbour. We had been told that the road from Te Hapua to Spirits Bay, a distance of 10 miles, was far too rough for a car and as I was not looking for a breakdown we decided to leave the car at Mr. Watt's and proceed north by horse transport. As the Parengarenga Harbour is rich in shell fish I collected quite a few "Mayena australasia" and "Monoplex parthenopeus" from the mud flats opposite our camp for the night.

Next morning we loaded our gear into a launch that landed us at Te Hapua at 8 am. We expected to see our horse drawn conveyance all ready for us with both driver and horses rearing to go, but alas, we were sadly disappointed. None of the Maoris who were on the wharf watching us with idle curiosity knew anything about transport arrangements for us. Finally Mr.Powell, who knew most of the "locals" contacted one who knew a little about our needs, with the result that we finally got in touch with our prospective driver. He seemed none too keen to make the trip and said his horses were not too good, and above all wanted to know "how much the trip was worth". Eventually he arrived with two skinny horses and a broken down old buggy which I immediately christened "The Spirits Bay Express". I don't think the Maori saw my joke. With our gear loaded there was just room for Mr. O'Connor and myself in the buggy besides the driver, so Mr.Powell walked ahead and it was not long before he had left us behind, such was our speed. The road was certainly rough with deep washouts running in all directions and we often found ourselves going along at an angle of 45 degrees. On the down hill grade the driver put the horses into "top gear" in an effort to try and catch up with Mr. Powell but failed to see a washout ahead with the result that the front axle (which was only wood) partly broke, and the wheels came in towards each other.

This was about 4 miles from Spirits Bay and we passengers then had to walk the rest of the way. Every minute we expected to see the buggy fall to pieces and have the pleasure of carrying our gear the rest of the way, but luck was with us, and apart from picking up numerous articles of gear that fell off our "express" we finally made camp at 3.30 pm. After a hasty lunch we repaired the broken axle with wire, and dispatched the driver on his return journey. Our camp was made right on the side of the road in a patch of scrub, and our fire was on the side of the road itself. We were at the extreme end of the King's Highways in the far north so had no worries from passing traffic.

As we were all keen to explore the surrounding country and had a few hours of daylight left we made a start with our collecting on a hill a mile or so away from camp, where a wonderful view was obtained of Spirits Bay and surrounding coast line. Tea was had by candlelight and it was a rather tired but happy party who finally crawled into our 8 x 8 tent for the night.

- - etc - -

GREAT BARRIER ISLAND: M. HOLLOWAY

A glance at the maps shows how this long island and the Little Barrier form a barrier between Cape Colville and the mainland and give us the great Hauraki Gulf.

Great Barrier Island is roughly 25 miles long and 12 miles wide at widest part near Port Fitzroy where it rises to a height of 2,000 foot on Mt. Hobson.

The west coast is very rugged, with bush clad cliffs and deep water and deep inlets providing good anchorage for ships, in fact Port Abercrombie, on which the settlement of Port Fitzroy is

situated, could shelter a fleet. The east coast is quite different, with open rolling country, long sweeping white beaches and very picturesque rocky headlands and islands.

My friend and I had a night trip down on the grimy little cargo boat which is the only means of transport for settlers and visitors. It does not cater for passengers, so we were agreeably surprised to find that, by our early reservations we were allotted two of the four bunks in the tiny saloon where the crew came and went all night for cups of tea, whereas the remainder of the passengers slept - or tried to - on the floor of the hold.

We left Auckland at 10 p.m. and were steaming into Port Abercrombie at 6 a.m. on a lovely March morning, with the still deep waters of the harbour like a mirror. After unloading goods at Port Fitzroy we started on the delightful trip down the coast, with halts at Whangapara and Okupu to deliver supplies, and finally disembarked at the last port, Tryphena, at 10 a.m. There was only one guest house open on the Island, so our host was there with his lorry to meet us and a few other guests and transport us across the range to pretty Oruawharo.

We loaded ourselves and our luggage on to the lorry with the cases and sacks of provisions for the settlers on route. An old car seat backed against the cab of the lorry was quite inadequate and some of us sat on the sacks for the rough, jolty journey. However, what we lacked in comfort was amply made up for as we crossed the central range and could see as we looked back over Tryphena harbour, Cape Colville and many islands in the Gulf.

- - etc - -

The distances are great and with limited time on a brief holiday, few areas can be seriously explored. For instance, the few species I collected while waiting for the boat at Tryphena on the return home, prove that area to be well worth a longer visit.

I said - "Waiting for the Boat!". We left Oruawharo at 5 a.m. and jolted over to Tryphena, expecting to catch the boat at 6 a.m. We knew it had left Tauranga, so dared not go far afield in case it appeared around the point any minute. It rained so we sheltered in the wharf shed, the tide receded and I made several attempts to do some collecting minus all my collecting gear which was packed. The tide came in and still we waited! At 6 pm, the boat appeared around the point and went to the wharf across the bay and sent word that she would sail at 6 a.m. tomorrow.

We selected enough luggage for the night, climbed on to the lorry which with less cargo, bounced more and went home for the night only to start off again at 5 a.m.

Another breakdown on the way up the coast with a close shave of drifting on to the rocks, ending in a tow into Fitzroy for minor repairs brought our adventures to a close and we finally reached Auckland at 9 p.m. Even with these transport annoyances, the Barrier is well worth the trip and everyone that visits it wants to go back.

COLLECTING ALCITHOE ARABICA ON CHELTENHAM BEACH:

MRS. M.E. McKELLOW

For a good collecting spot, easily access to Auckland City, I give Cheltenham first place.

It is pleasant and clean and although other places, Takapuna and Narrow Neck reef for instance, seem to have become worked out, Cheltenham remains consistent. There, the very beautifully marked volute Alcithoe arabica, may still be found as abundantly as ever.

- - etc - -

These shells are widely distributed over the sand flat and may be found from North Head to the Narrow Neck end of the beach.

I will not readily forget one collecting day during the war period shortly after the Japanese entered the war, I was standing on a rock at the water's edge watching to see if the tide had turned, when suddenly there was a sound of machine gun fire and a spatter of bullets hit the water a few yards ahead of me! Believe me I nearly jumped into the sea. The explanation was in the evening paper - they were firing at a launch which was cruising about and had disregarded the signals.

Twenty Years Ago

From Nancy Smith

1981 started off with a new format, a new editor – Derek Lamb- and for the first time ended up with only 2 issues. Derek took over from Noel and Norman Gardner who had helped with the production of the club bulletins and Poirierias from the beginning . When first looking at technical matters of preparing the issue,Derek found that Poirieria contained approximately 500,000 words and said "If a picture is worth a thousand words , the number of plates and diagrams prepared and drawn by Norman must enable us to say "Thanks a Million."

The first Bulletin was in 1940 then the club went into recess till after the war. In 1946 Bulletin no.2 was prefaced by Miss E.N. Houghton – our Noel - as secretary . She and Norman were members of the committee that put together the early bulletins when they were done by many members helping out: one typing, one going to collect the folio paper (so precious straight after the war), others cutting and cyclostyling the stencils, and everyone gathering to put them together, an all day job. Those old Bulletins on folio paper are very fragile now, so if you have them do take care of them.

By bulletin no.5 Ken Hipkins had taken over from Miss Houghton as secretary and Mrs N Gardner had appeared on the scene as editor. November 1951 saw "a milestone reached" with a printed bulletin edited by Noel and Norman in tandem, and they carried on with that format until December 1961 with a short break while Noel produced more important issue!

"Poirieria", a quarterly magazine, arrived on the scene in 1962 – initiated by Norman and printed by Joan Coles on the newly aquired gestetner.The Gardners continued as co-editors and when members did not come across with enough articles the editors wrote them . Often an article was written by N. Gardner, and you have to guess which one--If its about land snails and has line drawings its an easy guess.!

In 1976/77 as well as "Poirieria" we had a new series of Bulletins, designed for publication of original scientific papers. Once again it was a new format and a step up in paper (glossy) and photographic illustrations. But it only ran to 2 volumes. "Poirieria" never faltered and nor did the Gardners who went on editing until 1981 and are still occassionally writing. Norman did 2 terms as president and initiated the "Poirieria' and Noel was secretary for many years.

Although its "Twenty Years Ago" since they handed the editorship over and they are heading together into their 9th decade, Noel and Norm still keep a great interest in the club and all its activities, Noel is a repository of important information on the history of the Conchology Section and a scrutineer at all our auctions while Norm delighted us all again with some of his beautiful carved wood trophys for presentation to the judges at our recent shell show.

Noel and Norman Gardner

First record of the aeolid nudibranch *Protaeolidiella juliae* (Burn, 1966) in New Zealand

by Richard C. Willan

Recently I identified *Protaeolidiella juliae* (Burn, 1966) from a frame off a video film taken by Ian Nilsson on 3 September 1999 at 18 metres in Cave Bay, Tawhiti Rahi Island, Poor Knights Islands, New Zealand. The animal was observed on one of the major branches of a large colony of the hydroid *Solanderia ericopsis* that was growing vertically off a rock on the floor of "Barren Arch". Ian's image is reproduced here as Figure 1.

The external characteristics of *Protaeolidiella juliae* that follow have been summarised from Marshall & Willan (1999). Coloured photographs of it can be found in that book, as well as those by Willan & Coleman (1984), Coleman (1989), Ono (1999) and Suzuki (2000). Among aeolid nudibranchs, *Protaeolidiella juliae* is recognisable because of its slender body ending in a long tail with a pointed tip. The back is low and rounded in profile, and there is a slightly projecting ridge along the edge of the back. The rhinophores are short and stout with rounded tips. The oral tentacles are twice as long as the rhinophores and they taper to pointed tips. The finger-like processes off the back (cerata) are slender and smooth, and they taper evenly to a pointed tip. In living specimens the cerata appear to arise irregularly along the ridge on mantle edge but they are actually arranged in several clusters, especially the anterior-most ones.

The background colour to the body is dark maroon, but it appears black when an animal is seen in its natural habitat under the water. This colour fades rapidly to dull pink to red in preservative fluids. The original description (Burn 1966) was based on only two preserved specimens. There is a prominent, mid-dorsal, white streak running longitudinally along most of the back and there are numerous white specks on the back on either side of this central streak. The rhinophores, oral tentacles and cerata are the same maroon colour as the body and their tips are white. Internally the radular teeth are minute and each is shaped like a curved comb with exceedingly long and delicate spines coming off the outer edge. The male genitalia consist of a papilla at the genital opening followed by an enlarged prostatic sac. *Protaeolidiella juliae* does not store zooxanthellae in its cerata, which makes it unique in its family, the Aeolidiidae (Rudman 1990).

Although one might think the black and white colour pattern would render *Protaeolidiella juliae* obvious against the background of its hydroid host, it is actually very well camouflaged because the long narrow body with the single row of cerata resemble the structure of the host hydroid incredibly well. Ian did not collect his animal and he did not search for any others, but I have little doubt that it was not the only one at "Barren Arch" on that occasion; any others probably escaped notice because of their camouflage.

Protaeolidiella juliae grows to 41 mm extended crawling length in Australia, which was approximately the size of the animal observed by Ian in New Zealand, so it would have been sexually mature.

In eastern Australia I have often noted several *Protaeolidiella juliae* animals of all sizes as well as several of their spawn ribbons on the same hydroid colony. The fact that none of the pale pink ribbons of eggs were on the hydroid where Ian discovered his animal at "Barren Arch" indicates that, unlike the situation in eastern Australia, the animal was the only one on that particular clump and so it had neither mated nor spawned. These ribbons of brightly coloured spawn, wound round axes of the hydroid host that have been striped bare by *P. juliae*, are usually the first indication of the presence of this species on a colony of *Solanderia* since they are conspicuous on the hydroid which usually grows in shaded rock clefts and beneath overhangs.

Unlike most aeolids, *Protaeolidiella juliae* is slow-moving. In nature, an animal apparently never leaves it "home" colony of *Solanderia* hydroid. I have found that this nudibranch will not crawl away from its host, even when a colony is collected and brought into the laboratory for study.

There is another species of *Protaeolidiella* in the Indo-Pacific Ocean - *P. atra* Baba, 1955. Despite being similar in appearance to *P. juliae*, *P. atra* grows approximately twice as large and Kikutarô Baba described differences such as more numerous and longer cerata that are closely set on the ridge at the edge of the mantle but not arranged in groups, and no white streak on the dorsum when he undertook the most recent comparative study of *Protaeolidiella* (Baba 1992).

Although I have recommended Indo-Pacific marine molluscs should not be included into the New Zealand faunal list on the basis of single or very few records, because they could be the result of chance settlement of long-distance larvae that do not reproduce or recruit in New Zealand waters (Willan 1998), I think the case for making an exception for *Protaeolidiella juliae* is particularly strong. This nudibranch is widespread in the western Pacific Ocean, is already reported from Japan, Papua New Guinea, New Caledonia, Queensland, New South Wales and Lord Howe Island, and it is so well camouflaged that it can be easily overlooked. *Plocamopherus imperialis, Embletonia gracile* and *Okenia plana* are other nudibranchs that have this same distribution, though that of the latter could have been achieved in recent times by hull fouling. Essentially *P. juliae* will be found living anywhere in the western Pacific Ocean. Hopefully more New Zealand sightings will now be made now that its presence in New Zealand has been confirmed.

ACKNOWLEDGEMENTS
Ian Nilsson of Havelock North kindly agreed to the use of his photograph in this article. I am grateful to Jan Watson of Melbourne for identifying the hydroid in Ian's photograph and for advice on the current taxonomy of hydroids in the genus *Solanderia* in Australasia.

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Protaeolidiella juliae in situ on *Solanderia ericopsis*, 18 metres, Poor Knights Islands. Reproduced (with permission) from digital video frame by Ian Nilsson, 3 September 1999.

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INTERTIDAL BIOTA OF THE PROPOSED NGA MOTU MARINE RESERVE, NEW PLYMOUTH

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SUMMARY

A survey of the intertidal shore within the proposed Nga Motu Marine Reserve, south New Plymouth, adds 109 additional species to existing lists for the area, bringing the current total for the combined subtidal and intertidal for the proposed reserve to 418 (including 100 gastropods, 88 fish, 50 seaweeds, 36 bivalves, 35 sponges, 28 bryozoa, 24 echinoderms, 14 crabs and shrimps, 11 chitons, 13 coelenterates, 8 ascidians, 6 barnacles). This study provides the first records from the west coast North Island of three gastropods - *Cominella quoyana quoyana, Eatoniella globosa* and *Rissoella cystophora* and extends southwards the previously known geographic range of four other gastropods and two bivalves.

The diversity of intertidal life (172 species) in the rocky habitats of this area is comparable to that recorded from nearby Kawaroa Reef. These rocky shores around New Plymouth (Kawaroa Reef and Back Beach), partially sheltered by Paritutu and the Sugar Loaf Islands, contain the richest and most diverse intertidal biota of the Taranaki coast. The Taranaki coast lies adjacent to the fluctuating confluence of a south-flowing warm current and north-flowing south current. This is reflected in the coastal biota with the northernmost records of some cooler water species existing together with the southernmost records of some warmer water species.

INTRODUCTION

The Sugar Loaf Islands, adjacent to Port Taranaki, New Plymouth (39°S, 174°E), and the surrounding seabed, foreshore and water (Fig. 1) are protected from mining (particularly of hydrocarbons) under the Sugar Loaf Islands Protected Area Act 1991. Using the Fisheries Act (1986), MAF gazetted regulations prohibiting commercial fishing and limiting recreational fishing in this area. Because these acts do not provide full protection for this precious piece of coast and its biota, a group of concerned locals formed the Nga Motu Marine Reserve Project Society and are campaigning for the creation of a marine reserve around part of the Sugar Loaf Islands and a strip of coastline extending to the south-west. In preparing their case for a marine reserve application, the Society is required to document the biotic values of the proposed area and thus invited the authors to New Plymouth to undertake an intertidal survey.

Taranaki coast

The intertidal shore of Taranaki from Urenui around Cape Egmont to Hawera, is almost entirely boulder-lined, consisting of hard andesite boulders, cobbles and pebbles eroded out of the laharic breccias that form the low coastal cliffs. The laharic breccias were formed by lahars that flowed down from Mt Taranaki and its predecessors creating the ring plain that surrounds the mountains. These breccias consist of andesite clasts set in a matrix of relatively soft volcanic mud and sand, which in many places form a wave-cut low- to mid-tidal shore platform on which the boulders and cobbles sit. These low lying shore platforms and gravel deposits extend subtidally. The boulder beaches are interspersed with scattered sand beaches. In some places, as in the western half of the study area, sand forms a high tidal beach separated from the sea by a belt of

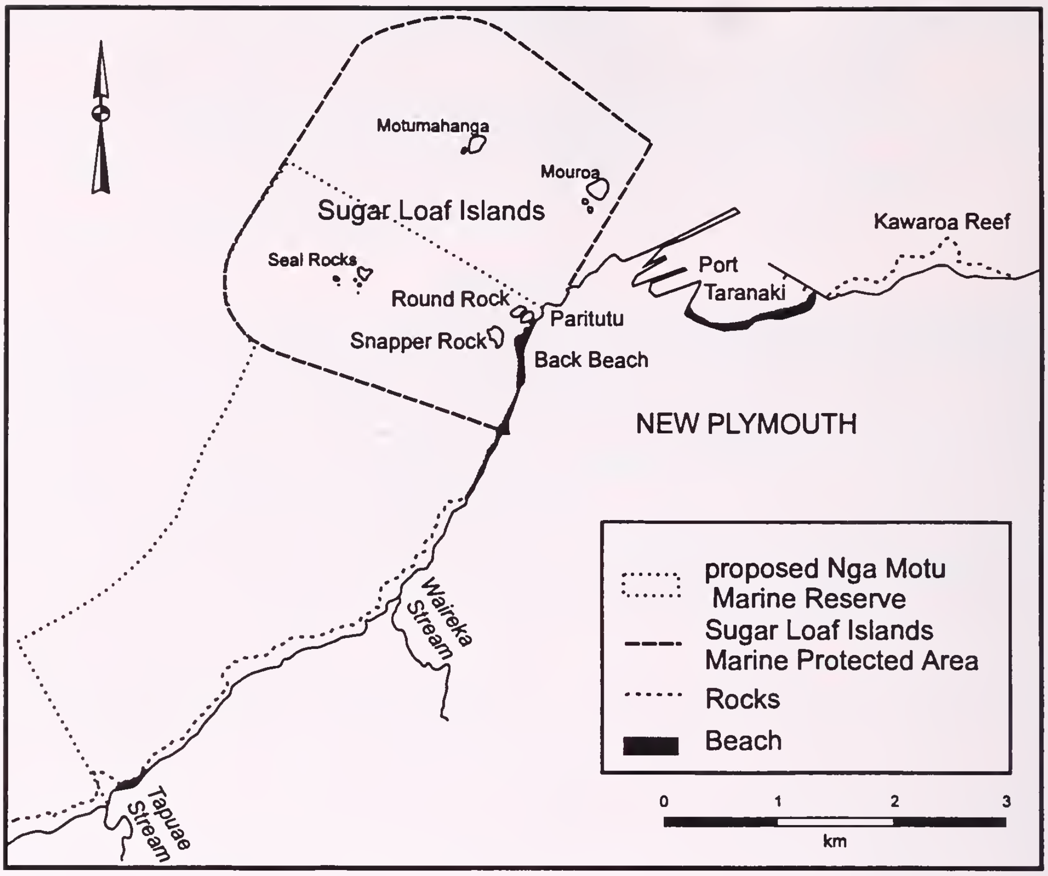

Fig. 1. Map of study area along the shores of the south-western suburbs of New Plymouth, Taranaki. The boundary of the present Sugar Loafs Marine Protected Area and proposed Nga Motu Marine Reserve are shown.

low tidal boulders. Periodically, mobile sand is moved inshore and may bury and smother parts of the boulder shore and underlying rock platforms.

North of Waitara, the north Taranaki coast consists of soft sandstone and mudstone cliffs mostly fronted by long sand beaches.

At New Plymouth, Paritutu and the Sugar Loaf Islands differ from the rest of the Taranaki coast, being eroded from hard andesite intrusives. They form a group of low sea stacks and islands that provide the firmest and most stable substrate on the Taranaki coast. In the lee of the Sugar Loafs (e.g. Kawaroa Reef and Back Beach) are the most sheltered habitats on the open Taranaki coast and consequently the most diverse intertidal communities (Hayward et al. 1999).

Previous work

Previous studies on the intertidal biota within the proposed reserve have included documentation of the main zonation patterns on Round Rock by Morton and Miller (1968, fig. 103) and a brief unpublished report on the dominant biota on the shore around the mouth of Waireka Stream (Anon 1991). The subtidal biota of the Sugar Loaf Islands, in the offshore part of the proposed reserve was documented by members of the New Plymouth Underwater Club (1989) with some specialist assistance with the identification of some groups. Their full species list includes 79 species of fish and 65 species of sponge (Department of Conservation 1996).

Beyond the proposed reserve boundaries, Hayward et al. (1999) recorded a diverse biota of 180 species on Kawaroa Reef, 3km north-east of Paritutu. Further to the south, Morton and

Miller (1968, fig.125) described the zonation of the boulder beach at Opunake, and a group of University of Auckland studies, undertaken as part of the Maui Development Environmental Study, documented and monitored natural change in the intertidal and shallow subtidal biota at Oaonui and Tataraimaka (Bergquist 1979, Foster 1978, Gordon 1980, Miller & Miller 1980, Miller 1982, Willan 1980a, b).

FIELD WORK

The intertidal shore between Paritutu and the mouth of Tapuae Stream was surveyed by the authors during spring low tides in February 2001. This survey involved comprehensive inspection of all the available habitats, documenting all the species of macroinvertebrate, micromollusc and seaweed present. Washed up shells were also surveyed as an indication of the composition of the mollusc fauna that lives in the subtidal sediments and rocky habitats just offshore within the proposed reserve area. Qualitative assessments of the abundance of all species were made during the surveys, and are given in the species list (below).

SPECIES LIST

The first four columns record species identified during our 2001 study, whereas the last two columns incorporate the records of previous studies within the proposed reserve area. This list does not include subtidal vertebrate and bryozoan records. Voucher specimens from the 2001 study are deposited in the Marine and Botany collections of the Auckland War Memorial Museum (AK).

A In lee of Sugar Loaf Islands - rocky shore and boulder beach
B Back Beach to Waireka beach washup
C Waireka toTapuae boulder beach and rocky shore
D Waireka to Tapuae boulder washup
E Waireka boulder beach and rocky shore (Anon 1991)
F Sugar Loafs Islands subtidal (New Plymouth Underwater Club 1989)
a = abundant c = common, f = frequent, o = occasional, r= rare; d = dead, l = live, x = present

	A	B	C	D	E	F
MOLLUSCA: POLYPLACOPHORA						
Acanthochitona violacea			f			l
Acanthochitona zelandica			r		l	
Chiton glaucus	c		c		l	
Cryptoconchus porosus	r					l
Eudoxochiton nobilis						l
Ischnochiton maorianus	o		r		l	
Leptochiton inquinatus			o			
Plaxiphora biramosa			r			
Plaxiphora caelata					l	
Plaxiphora obtecta			r			
Sypharochiton pelliserpentis	c		o		l	
MOLLUSCA: GASTROPODA						
Alcithoe fusus						x
Amalda (Baryspira) mucronata		d				
Amphithalamus falsestea	o		c			
Anabathron hedleyi		d				
Asteracmea suteri		d	r			
Astraea heliotropium						x
Austrofusus glans		d		d		
Buccinulum linea linea		d		d		l
Cabestana spengleri						x
Caecum digitulum	o					
Calliostoma pellucidum						l
Calliostoma punctulatum		d		d		l
Calliostoma selectum						l
Calliostoma tigris						l
Cantharidella tesselata	c		a		l	
Cantharidus opalus				d		l
Cantharidus purpureus						l
Cellana ornata	f		c	d	l	
Cellana radians	a		c	d	l	x
Cellana stellifera		d	r			l
Cerithiopsidae 2 spp.		d				
Charonia lampas						l
Chemnitzia spp.		d		d		
Cominella adspersa			r			
Cominella maculosa			f		l	
Cominella quoyana			r			
Cominella virgata						x?
Cookia sulcata		d	o			l
Crepidula costata				d		
Dicathais orbita	f		f		l	l
Diloma arida	a		c			
Diloma bicanaliculata	o			d	l	
Diloma coracina	c		f			
Diloma nigerrima	o				l	
Diloma zelandica			f			
Eatoniella albocolumella	o		c			
Eatoniella delli	r		r			
Eatoniella globosa?		d				
Eatoniella latebricola		d				
Eatoniella olivacea	o		o			
Eatoniella roseocincta		d				
Eatonina atomaria				d		
Eatonina subflavescens			o			
Epitonium jukesianum	c			d		
Gadinia conica		d				

	A	B	C	D	E	F
Haliotis australis				d		l
Haliotis iris	f		f			l
Haliotis virginea virginea						l
Haustrum haustorium	o		o		l	l
Janthina exigua		d				
Lepsiella albomarginata	c		c		l	l
Linopyrga rugata		d		d		
Maoricolpus roseus manukauensis		d		d		x
Melagraphia aethiops	o		f		l	
Micrelenchus sanguineus	c		c			
Nodilittorina antipodum	o		o		l	
Nodilittorina cincta	r		r			
Notoacmea elongata	o			d		
Notoacmea helmsi				d		
Notoacmea parviconoidea	c		c			
Notoacmea pileopsis pileopsis	c		o			
Onchidella nigricans	c		r			
Onoba fumata		d				
Paratrophon c. cheesemani	d			d		
Paratrophon c. exsculptus				d		
Patelloida corticata	c		c			
Penion sulcatus		d		d		x
Pisinna zosterophila	r					
Pleurobranchaea maculata	r					
Potamopyrgus estuarinus	c					
Radiacmea inconspicua	o					
Risellopsis varia	o		o			
Rissoella cystophora	r					
Rissoina chathamensis				d		
Scutus breviculus	f				l	
Semicassis pyrum		d				x
Sigapatella novaezelandiae		d		d		l
Siphonaria propria	o			d		
? Spectamen sp.		d				
Struthiolaria papulosa		d				x
Trichosirius inornatus		d				
Trochus viridis						l
Tugali elegans		d				
Tugali suteri						l
Turbo smaragdus	o		f		l	l
Xenophora neozelanica						x
Xymene traversi	c		c			l
Zalipais lissa		d				
Zeacumantus subcarinatus					l	
MOLLUSCA: GASTROPODA: NUDIBRANCHS						
Aphelodoris lactuosa						l
Archidoris wellingtonensis						l
Cadlina willani						l
Ceratosoma amoena					l	l
Chromodoris aureomarginata						l
Doriopsis flabellifera	r		r?			
Jason miriabilis						l
Polycera ?maddoxi						l
Trapania rudmani						l
Tritonia incerta						l
MOLLUSCA: BIVALVIA						
Anomia trigonopsis		d				
Atrina zelandica						l
Barbatia novaezelandiae		d		d		l
Borniola reniformis	o			d		
Cardita aoteana		d		d		l
Chlamys zelandiae		d		d		l
Corbula zelandica		d		d		
Diplodonta striatula		d				
Dosinia subrosea		d		d		
Felaniella zelandica		d				
Gari stangeri				d		x
Glycymeris modesta		d		d		
Hiatella arctica	c		o			
Irus reflexus		d				
Kellia cycladiformis				d		
Leptomya retiaria		d		d		
Mactra discors		d		d		
Modiolarca impacta		d				l
Modiolus areolatus		d				
Myadora boltoni		d				
Neolepton antipodum		d		d		
Nucula nitidula		d		d		
Paphies donacina		d		d		
Paphies subtriangulata				d		
Perna canaliculus	d		r	d		l
Peronaea gaimardi		d				
Philobrya munita		d				
Pholadidea tridens		d				
Pododesmus zelandicus						l
Protothaca crassicosta	f	d		d		
Pseudoarcopagia disculus				d		
Ruditapes largillierti		d				
Scalpomactra scapellum		d		d		
Tawera spissa		d		d		
Trichomusculus barbatus	r					
Xenostrobus pulex	a		a			l
MOLLUSCA: CEPHALOPODA						
Nototodarus sloanii						l
Octopus maorum						l
Spirula spirula		d		d		
ECHINODERMATA						
Allostichaster polyplax	o		r			l
Coscinasterias muricata	o		r		l	l
Echinocardium cordatum						l
Evechinus chloroticus	o		c		l	l
Fellaster zelandiae		d				
Ophionereis fasciata	o					l
Ophiopteris antipodum						l
Patiriella regularis	o		o		l	l
Pectinura maculata						l
Pentagonaster pulchellus						l
Stegnaster inflatus						l
Stichaster australis	f		o			l
Stichopus mollis						l
CRUSTACEA: REPTANTIA						
Elamena longirostris						l
Halicarcinus cooki	f					l
Halicarcinus innominatus			o			
Hemigrapsus edwardsi	o		o			
Leptograpsus variegatus	f			d	l	
Notomithrax minor	o					
Notomithrax ursus	f					
Ovalipes catharus		d	o			
Pagurus novizelandiae	c		c		l	l
Petrolisthes elongatus	o		f		l	
Plagusia chabrus	o		f			l
CRUSTACEA: DECAPODA						
Alope spinifrons	f		o			
Jasus edwardsii						l
Jasus verreauxi						l
Palaemon affinis					l	
CRUSTACEA: BARNACLES						
Balanus vestitus						l
Chamaesipho columna	a		a		l	x
Chamaesipho brunnea	c		c			x
Epopella plicata	c		c		l	x
Notomegabalanus decorus						l
Tetraclita purpurescens	o		f		l	
CRUSTACEA: AMPHIPODA						
Hyale maroubrae	o					
Paraweldeckia thomsoni	o					
ISOPODA						
Euiodotea durvillei	o					
COELENTERATA						
Actinia tenebrosa	o		o		l	
Actinothoe albocincta						l
Alcyonium aurantium						l
Corynactis haddoni						l
Culicia rubeola						l
Diadumene neozelanica	o		f			

	A	B	C	D	E	F
Isactinia olivacea	o		f		l	
Isocradactis magna	c		r			
Monomyces rubrum						l
Parazoanthus sp.						l
Physalia physalis		d				
Solandaria racemosa						l
Tubularia sp.						l
PORIFERA						
Anchinoe sp.						l
Ancorina alata						l
Axinella tricalyformis						l
Axinellida spp.						l
Biemna spp.						l
Cacospongia sp.						l
Callyspongia ramosa						l
Carteriospongia sp.						l
Cinachyra sp.						l
Ciocalypta cf. *polymastia*						l
Cliona celata	o					l
Crella incrustans						l
Darwinella gardineri						l
Desmacella dendyi						l
Dysidea sp.						l
Homaxinella sp.						l
Hymedsmia sp.						l
Hyrtios sp.						l
Iophon sp.						l
Latrunculia sp.						l
Microciona coccinea	r		r		l	l
Pararhaphoxya sp.						l
Polymastia fusca						l
Polymastia granulosa						l
Psammocinia sp.						l
Pseudoaxinella cf. *australis*						l
Raspalia agminata						l
Raspalia topsenti						l
Spongia sp.						l
Stellata conulosa						l
Stellata cf. *diversiraphidophora*						l
?Suberites axinelloides	o					
Tethya aurantium	r				l	l
Tethya australis			r			l
Tethya mortoni	r					
POLYCHAETA						
Galeolaria hystrix	o		r			
Neosabellaria kaiparaensis			c			
Salmacina australis	f		c			
Spirobranchus cariniferus	c		o		l	
Spirorbis sp.			c		l	
ASCIDIANS						
Aplidium sp.						l
Asterocarpa coerulea						l
Cnemidocarpa bicornuta						l
Corella eumyota			r			
Didemnum candidum						l
Didemnum densum						l
Diplosoma listerianum						l
Pyura sp.	r					

	A	B	C	D	E	F
BRACHIOPODA						
Calloria inconspicua	r			d		l
ALGAE						
Ballia scoparia?	o					
Bryopsis plumosa						l
Capreolia implexa					l	
Carpophyllum angustifolium	o		o			
Carpophyllum flexuosum	o		o			
Carpophyllum maschalocarpum	a		a			l
Caulerpa sedoides nz						l
Chaetomorpha aerea			o			
Chaetomorpha sp.	o					
Chordaria cladosiphon	o		o			
Colpomenia sinuosa	o		o			l
Corallina officinalis	a		a		l	l
Cystophora torulosa	c		c			
Dasya sp.	o					
Dasyclonium incisum	o		o			
Dictyota dictotoma?			o			
Dictyota sp*?*			o			
Enteromorpha ?compressa	o					l
Enteromorpha sp.			o			
Gigartina cranwelliae					l	
Gigartina livida	o		o			
Glossophora kunthii			c			
Griffithsia traversii	o		o			
Haliptilon roseum	o		o			
Halopteris virgata	o		o			
Helminthocladia densa?	o		o			
Herposiphonia ceratoclada	o					
Heterosiphonia tessellata	o		o			
Hildenbrandia crouani					l	
Hormosira banksii	o		c			l
Jania micrarthrodia	o		o			
Landsburgia quercifolia			o			
Laurencia thyrsifera	o		o		l	
Metamorphe colensoi	o		o			
Microzonia velutina	o		c			
Notheia anomala			o			
Petalonia fascia	o		o			
Plocamium costatum						l
Plocamium microcladioides	o		o			
Polysiphonia sp.						l
Porphyra columbina	o					
Pterocladia lucida			o			l
Pterocladiella capillacea			o		l	
Rhodymenia linearis ?			o			
Rhodymenia obtusa ?	o		o			
Scytothamnus australis	c		c			
Splachnidium rugosum	f		c			
Ulva lactuca	o					
LICHEN						
Lichina confinis	c					
FISHES						
Acanthoclinus quadridactylus					l	
Trachelochismus pinnulatus	o		c			

ECOLOGICAL NOTES

In the lee of the Sugarloafs

One hundred and sixteen species were found living intertidally on or under the rocks and cobbles in the lee of Snapper and Round Rocks and in the small, partly sheltered bay between Round Rock and Paritutu (Fig. 1).

The sheltered, south-east facing andesite faces of Snapper and Round Rocks have a full intertidal zonation (Fig. 2) from the high tidal black lichen *Lichina confinis* and limpet *Notoacmea pileopsis*, down through bands of the barnacles *Chamaesipho brunnea* and *C. columna*, flea-mussel *Xenostrobus pulex*, pink coralline turf and paint, to the low tidal seaweed belt dominated by *Carpophyllum maschalocarpum*. Also common on these intertidal rock faces are the limpets *Cellana ornata*, *C. radiata*, and *Notoacmea parviconoidea*, leathery slug *Onchidella nigricans*, oyster borer *Lepsiella albomarginata*, chiton *Sypharochiton pelliserpentis*, ribbed barnacle *Epopella plicata*, and orange seastar *Stichaster australis*.

At the time of our visit a thick build-up of sand had recently smothered a rich low-tidal boulder habitat on the sheltered side of Snapper Rock. Still largely free from sand was a similar area of large and small boulders and cobbles around mid to low tide level at the foot of Paritutu. This contained the richest and most diverse intertidal community within the proposed reserve area - a result of the partial shelter provided by Round Rock, the diversity of habitats on the top, sides and beneath the boulders, and the lack of smothering sand. Here at low tidal *Carpophyllum maschalocarpum* is joined by a number of other less abundant seaweeds, such as *C. angustifolium, C. flexuosum, Cystophora torulosa, Gigartina livida, Haliptilon roseum, Laurencia thyrisifera, Microzonia velutina* and many others. On boulders and in pools slightly higher on the shore are other more scattered, often seasonal, seaweeds such as Neptunes necklace *Hormosira banksii*, *Porphyra columbina*, *Scytothamnus australia*, *Splachnidium rugosum*, and *Ulva lactuca*.

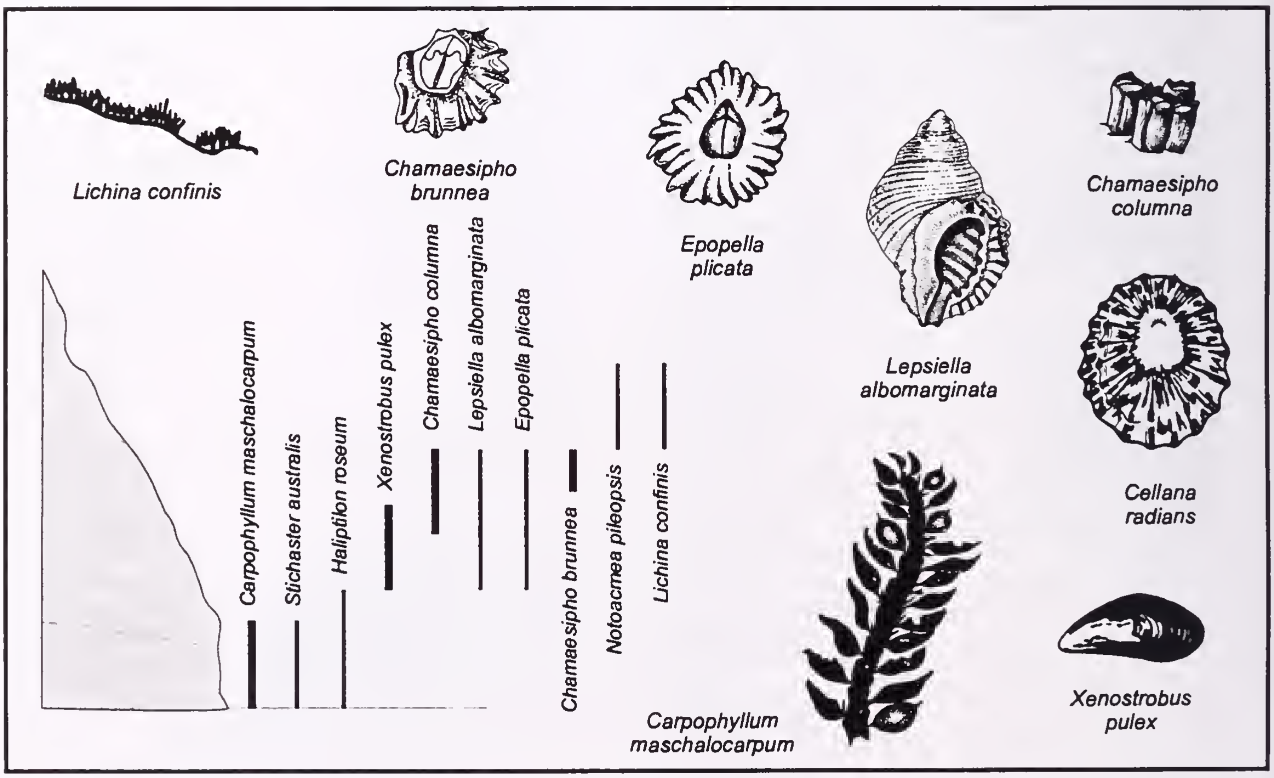

Fig. 2. Intertidal ranges of dominant zoning organisms on the intertidal landward face of Round Rock, Sugar Loaf Islands. Drawings by Margaret Morley.

Common grazing gastropods at mid and low tide levels are *Diloma arida, D. coracina, Melagraphia aethiops, Cantharidella tesselata* (on seaweed), *Micrelenchus sanguineus* (on seaweed), and beneath cobbles small paua *Haliotis iris,* the large black "slug" *Scutus breviculus*, and the chitons *Chiton glaucus* and *Ischnochiton maorianus.* Common carnivorous gastropods are *Dicathais orbita* and *Xymene traversi.* The commonest crabs are the small hermits *Pagurus novizelandiae,* masking crab *Notomithrax ursus*, purple rock crab *Leptograpsus variegatus* and pillbox crab *Halicarcinus cooki.* The large, multi-coloured anenome *Isocradactis magna* is common, as is the encrusting tubeworm *Spirobranchus cariniferus.* A rare find intertidally were several specimens of the small red brachiopod *Calloria inconspicua* attached to the underside of a boulder. The wentletrap *Epitonium jukesianum* was common sieved alive in sandy pools near its host the large anemone *Isocradactis magna.*

Western boulder shore (Fig. 3)

At the time of our visit, the most striking aspect of the western half of the surveyed shore was the enormous build-up of sand which had clearly buried and smothered most of the low and mid tidal boulder habitats along the whole stretch of coast. In places where the boulders sit on an intertidal rock platform of eroded laharic breccia, the platform was almost everywhere completely buried. In several places the sand had been swept clear of small portions of previously buried platforms and they were completely bare of any life forms save for the white colour of the dead coralline paint. In places longer seaweed straps of *Carpophyllum* and *Cystophora torulosa* had just their tips sticking out from the sand drifts. In several places the sand had driven all the kina *Evechinus chloroticus*, from their normal grazing grounds and they were clustered together in their hundreds, probably starving, around the sand ensheathed bases of the larger protruding boulders. Other mobile members of the fauna (e.g. gastropods) were also found concentrated in artificially high numbers in small refuges around large boulders or in partially sand-filled tidal pools.

From these refuges we were able to determine the overall character of the biota that lives intertidally along this stretch of coast during the long intervals when it is relatively free from sand build-ups. One hundred and ten species were recorded living here. Most of the high-mid tide zone was occupied by a wide strip of sand beach. Near Wairere Stream mouth the laharic breccia rock platform protrudes above the sand and is home to occasional periwinkles *Nodilittorina antipodum* and *N. cincta*, barnacles *Chamaesipho brunnea, C. columna* and *Epopella plicata*, limpets *Cellana radians* and *C. ornata*, dark red anenome *Actinia tenebrosa*, and the encrusting dark red seaweed *Apophloea sinclairii.*

On the sides of stable boulders at mid and low tide levels are common encrusting flea-mussels *Xenostrobus pulex* and barnacles *Chamaesipho columna*, and their predator the oyster borer *Lepsiella albomarginata*, together with occasional clumps of sand tubeworms *Neosabellaria kaiparaensis* and the calcareous tubeworm *Spirobranchus cariniferus.* In and around the few remaining pools are the common whelk *Cominella maculosa,* Cook's turban *Cookia sulcata,* hermit crabs, and the anenome *Isactinia olivacea.* Living under smaller, but stable cobbles and boulders sitting on a rock platform at low tide are common chitons *Chiton glaucus, Acanthochitona violacea* and *Ischnochiton maorianus*, the suckerfish *Trachelochismus pinnulatus* and multicoloured anenome *Diadumene neozelanica.* Perfectly camouflaged, the nudibranch *Doriopsis flabellifera* adheres closely to its prey, an orange encrusting sponge. Low tidal seaweeds attached to the boulders are dominated by *C. maschalocarpum, C. torulosa, Microzonia velutina, Glossophora kunthii, Landsburgia quercifolia, Pterocladia capillacea* and *P. lucida.* Higher on the shore, often attached to the underlying rock platform are Neptune's necklace *Hormosira banksii* and seasonal seaweeds

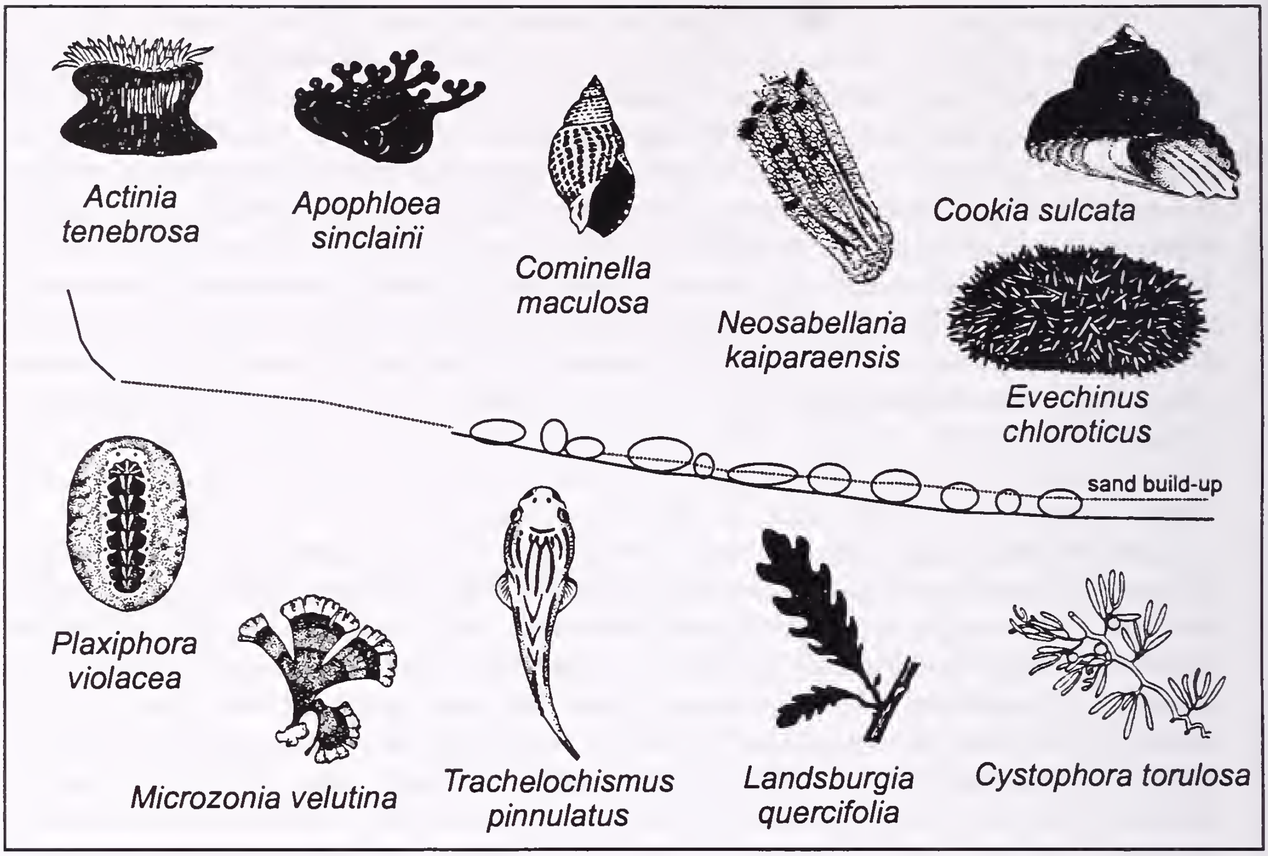

Fig. 3. Common and characteristic organisms of the intertidal western boulder beaches, west of the Sugar Loaf Islands. Drawings by Margaret Morley and Morton and Miller (1968).

Colpomenia sinuosa and *Splachnidium rugosum.* The bivalve *Hiatella arctica* is common in algal holdfasts.

An attractive striped form of the limpet *Notoacmea helmsi* was found living on intertidal cliff faces at Pukearuhe, North Taranaki (Hayward et al. 1997). Several shells were found washed up on the beach and undoubtedly it lives within the proposed reserve. This appears to be a local variant, as specimens elsewhere do not have contrasting stripes. Another small limpet *Radiacmea inconspicua* was found alive on a cat's-eye shell.

Beach wash-up

Seventy-three species of mollusc shell were found washed up on the beaches within the proposed reserve. These are a mix of species that live:

a. intertidally on rocks or seaweed within the reserve (30 species, 13 recorded live), e.g. *Cellana radians, C. ornata, Perna canaliculus, Protothaca crassicosta*;

b. subtidally on rocks within the reserve (14 species, 10 recorded live at Sugar Loafs), e.g. *Calliostoma punctulatum, Cantharidus opalus, Sigapatella novaezelandiae, Cardita aoteana, Chlamys zelandiae*;

c. in shallow subtidal sand as infaunal surf clams within the reserve (3 species), e.g. *Mactra discors, Paphies donacina* plus the sand dollar *Fellaster zelandiae*;

d. on or in offshore sediment, possibly within the reserve (27 species), e.g. *Amalda mucronata, Austrofusus glans, Struthiolaria papulosa, Corbula zelandica, Glycymeris modesta, Nucula nitidula, Scalpomactra scapellum, Tawera spissa*; or

e. pelagically and wash ashore dead (2 species), e.g. *Janthina exigua, Spirula spirula* (internal shell of cuttlefish).

The only live inhabitant of the beach sands observed was the swimming crab, *Ovalipes catharus.*

MOLLUSCAN BIOGEOGRAPHIC NOTES

This study extends the recorded geographic ranges of nine mollusc species (below). Powell's (1979) published ranges have been used when commenting on extension of range, because Spencer and Willan (1996) give zoogeographic provinces only. These provinces (Powell 1955) are used to summarise the known range of each species (A = Aupourian, C = Cookian, F = Forsterian, M = Moriorian, An = Antipodean). Additional records from the collections of Auckland Museum(AK) and Margaret Morley (MM) are cited where they extend the published range.

***Cominella quoyana quoyana* A. Adams, 1854**

Previously recorded from the northern part of New Zealand from the Bay of Islands to East Cape (Powell 1979). The live specimen recorded here is the first west coast record of this species, although we know of additional specimens from Destruction Gully and Whatipu, at the entrance to the Manukau Harbour (AK). These extend the species range to A and C provinces.

***Eatoniella latebricola* Ponder, 1965**

Previously recorded from Muriwai, west coast Auckland, under *Durvillaea* holdfasts (Powell 1979) and Raglan (Hayward et al, in prep.). The New Plymouth specimen found dead in algal wash (AK 105403) provides an extension of range south of Raglan. Owing to the difficulty accessing its restricted habitat, it is seldom collected alive. The species range is A and C provinces.

***Eatoniella globosa* Ponder, 1965**

Previously recorded from the north and east coasts of Northland, this New Plymouth specimen (AK 105398) is the first record on the west coast of the North Island. Its range is now A and C provinces.

***Rissoella cystophora* (Finlay, 1924)**

Previously recorded from the east coast of the North, South, Stewart and Chatham Islands, these specimens (AK 105401) found in algal washes, are the first published record on the west coast of the North Island. We know of additional records from algal washes at Ahipara, west coast Northland, and Dusky Sound, Fiordland (MM). The species range is now A, C, F and M provinces.

This New Plymouth study extends the range of three gastropods and two bivalves south of Kawhia on the west coast of the North Island (Morley et al. 1997): *Doriopsis flabellifera* (Cheeseman, 1881) (AK 105274); *Linopyrga rugata rugata* (Hutton, 1886) (AK 105402); *Tugali elegans* Gray, 1843 (AK 105454); *Myadora boltoni* E.A. Smith, 1880 (AK 105397); *Kellia cycladiformis* (Deshayes, 1834).

DISCUSSION

Offshore Taranaki lies at the fluctuating confluence of two surface water currents - the cooler, north-flowing Durville Current and the warmer, south-flowing West Auckland Current. The exact current patterns are not fully understood and are believed to vary seasonally (Adams 1994).

The effects of the northern flowing Durville Current are reflected by molluscs which have northern and southern variants or subspecies. The siphon whelk *Penion sulcatus* found at in the proposed marine reserve at New Plymouth is the southern form without nodules on the whorls. The small grazing gastropod *Eatoniella roseocincta* found in algal wash, were all pink and white banded which is the southern form. Northern variants of the same species are

uniformly rose-pink (Powell 1979). The muricid, *Paratrophon cheesemani exculptus*, the southern subspecies, was found at New Plymouth but not the northern subspecies *P. cheesemani cheesemani*. Both subspecies were found in a survey of North Taranaki (Hayward et al 1999).

The effects of the southward flowing West Auckland Current are shown by molluscs present at New Plymouth usually found further north. The orange nudibranch *Doriopsis flabellifera,* the pyramidellid *Linopyrga rugata* and the fissurellid *Tugali elegans* are recorded for the first time south of Kawhia (Morley et al 1997).

A total of 418 marine and intertidal species are now recorded from the proposed Nga Motu Marine Reserve. 218 of these species are recorded here from the intertidal. Forty-six of these are washed-up shells of subtidal or pelagic molluscs. Thus 172 species are so far recorded living intertidally on the rocky shorelines of this area. The census is incomplete for amphipods, isopods, sponges and smaller invertebrates, and obviously will be supplemented periodically by finds of rarer taxa or new colonisers. This diversity is comparable with the 180 species recorded (Hayward et al. 1999) from the intertidal rocky habitats of Kawaroa Reef, also partially sheltered by the Sugar Loaf Islands, but to the east of them (Fig. 1). This and the previous study of north Taranaki clearly show that the rocky shores around New Plymouth (Kawaroa Reef and Back Beach), partially sheltered by Paritutu and the Sugar Loaf Islands, contain the richest and most diverse intertidal biota of the Taranaki coast.

In selecting sites for potential marine reserves, various criteria need to be considered. A long-term goal of a marine reserve network is to protect in perpetuity the richness and full diversity of our marine biota. To achieve this requires protecting the best representative examples of the complete diversity of marine habitats in each coastal region, so that breeding populations of all the biota survive to reseed areas beyond the reserve boundaries. Thus on the west coast of the North Island, a sound argument could be made to establish a marine reserve that protected at least part of the most sheltered section of rocky coast at New Plymouth with its consequent high diversity of microhabitats and biota. If a reserve is established in this area, it should be recognised that natural sand build-up on the coast will periodically impact upon and kill off much of the biota. Once the sand recedes the previous diversity of intertidal life could be expected to recolonise and return within a few years, reseeded from unimpacted refuges locally and more distant. At the present time, it appears that Kawaroa Reef is less affected by periodic sand accumulation than the proposed Nga Motu Reserve area, possibly because sand moving northwards along the coast is first captured in Port Taranaki, dredged out and dumped out to sea.

ACKNOWLEDGEMENTS

We thank the committee of the Nga Motu Marine Reserve Project Society for the invitation to undertake the survey and for the hospitality during our visit. We particularly thank Anne and Brian Scott for providing accomodation and helpful advice. Brett Stephenson and Doug Rogan assisted with crustacean and seaweed identifications respectively.

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Unusual washup on Waikuku Beach, Canterbury

by Edyth Coursey

Waikuku Beach is on the south side of the Ashley River in Canterbury. From there the sandy beach curves south to New Brighton. The usual shells found there are bivalves such as: Dosinia anus, usually whole; Spisula aequilateralis, usually whole, often live; Paphies subtriangulata subtriangulata, often live; Mactra murchisoni, usually single valves, rarely whole; Tellina gaimardi; Soletellina nitida; Perna canaliculus, usually in clumps of seaweed; single valves of small pecten and mussels; and near the river mouth, Amphibola crenata are plentiful, also Chione sutchburys.

In July, after a flood, the river cut a new channel further north and left a good supply of stones on the beach. Among the stones were patches of shells towards high tide line. I found many good species of Zenatia acinaces which were complete but very dead. Most of the shells still had periostracums, large ones dark brown and the smaller ones lighter. These shells were very difficult to clean as the adductor muscles were welll embedded in the shell. There were some Resania lanceolata, some were complete but most damaged. Other finds were: Tellina spenceri, live; Paphies australis and odd valves of Panopea australis and Offadesma angasi.

I have been walking along this beach since 1932 whenever I can. In all those years I have never noticed many of these shells. At Easter 1983 there was another change in the river mouth when, among stones on the beach, was a good collection of Zenatia acinaces and Resania lanceolata but they were all whole but empty.

Range extension of *Plesiotriton mirabilis* Beu & Maxwell (Cancellariidae, Plesiotritoninae)

by Walter O. Cernohorsky

Over 20 years ago, I received a photograph of a small gastropod from the collection of Dr. D. Shasky for identification. This gastropod displayed shell features of *Tritonoharpa* Dall, 1908, but the columella also had 4 strong cancellariid type columellar folds. Not having encountered a similar species before, I searched all available literature for a prior description but to no avail.

Several years later, Beu & Maxwell (1987) described the species as *Plesiotriton mirabilis,* and their description was based on a purchased specimen from Rabaul, New Britain, Papua New Guinea, and a specimen collected at Laulasi Id., west coat of Malaita, Solomon Ids. collected by P.H. Colman.

The Shasky specimen illustrated here came from off Cairns, Nth. Queensland, Australia, and measures 30.00mm in length. Because of the species' rarity, its area of distribution remains unknown. On shell characters alone (columellar folds excluded), the living *P. mirabilis* appears closer to the Recent *Tritonoharpa antiquata* (Hinds in Reeve, 1844), and seems out of place among the Upper Cretaceous-Eocene species of *Plesiotriton* Fischer, 1884.

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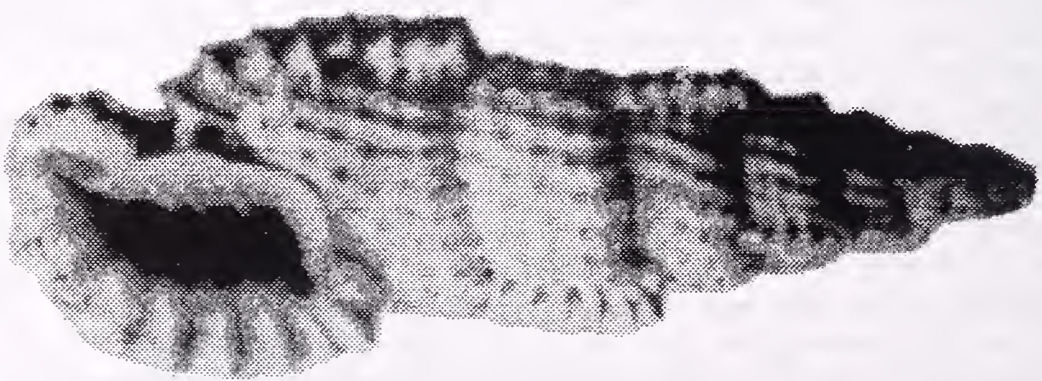

Placiphorella atlantica (*Polyplacophora*) discovered in N.Z. Waters

Bruce F. Hazelwood
Frank Boulton

Placiphorella atlantica (Verrill and Smith,1882) is a cosmopolitan, bathyal - abyssal component of world seas. This chiton is usually found at depths greater than 100 meters in N.Z. waters. More specimens and localities from Subantarctic waters are known. (Steve O'Shea, NIWA, pers.comm.)

Review of the Genus *Placiphorella* Dall,1879, ex Carpenter MS (*Polyplacophora : Mopaliidae*) with Descriptions of Two New Species Roger N. Clark - The Veliger 37(3) : 290 - 311 (July 1, 1994)

The only N.Z. Record
1, LACM 34412 South - West of Auckland Islands, New Zealand
(51° 07' South, 162° 02' East),1647 - 1665 meters

Type Locality
Off Nantucket Island, Massachusetts (40° 01' North,68° 54' West),1170 meters

Type Material
Holotype, of *P.atlantica* USNM 106921

Holotype of *P.uschakovi*, ZIAS
Paratype of P.*uschakovi*, CAS 019464, North of Cape Elizabeth,Sakhalin Island, Sea of Okhotsk, Russia, 500 meters

Lectotype of *P. pacifica*, SBMNH 34394,Kasaan Bay, Prince of Wales Island, South - East Alaska, 173 - 179 meters.

Distribution
Off Europe and Africa between latitudes 25° North and 62° North (P.Kaas pers. Comm.) (Clark 1994)
1992)
Off the Pacific coast of North America, from the Bering Sea to the Gulf of California

Off South America - near Chile

Off Asia from the Sea of Okhotsk to the Makassar Straight, Indonesia.

Near Australia,Tasmania,New Zealand and in Antarctic seas.

A Further Record from New Zealand

1977 Beu A.G. Journal of the Wellington Shell Club, New Zealand. Cookia,Vol 2, No 2,Page 44

"*Placiphorella n.s.p.*

A collection of several seperated valves from 500 meters off the Three Kings Islands has the extremely short, wide valves and finely dimpled surface of Placiphorella, and has more than 20 slits around the very short, thick insertion plates of the anterior valve.The genus has not previously been recorded from the southern hemisphere.to my knowledge. (Beu)"

Acknowledgements

Steve O'Shea N.I.W.A. Wellington (For unpublished information)

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For permission to photocopy illustrations.

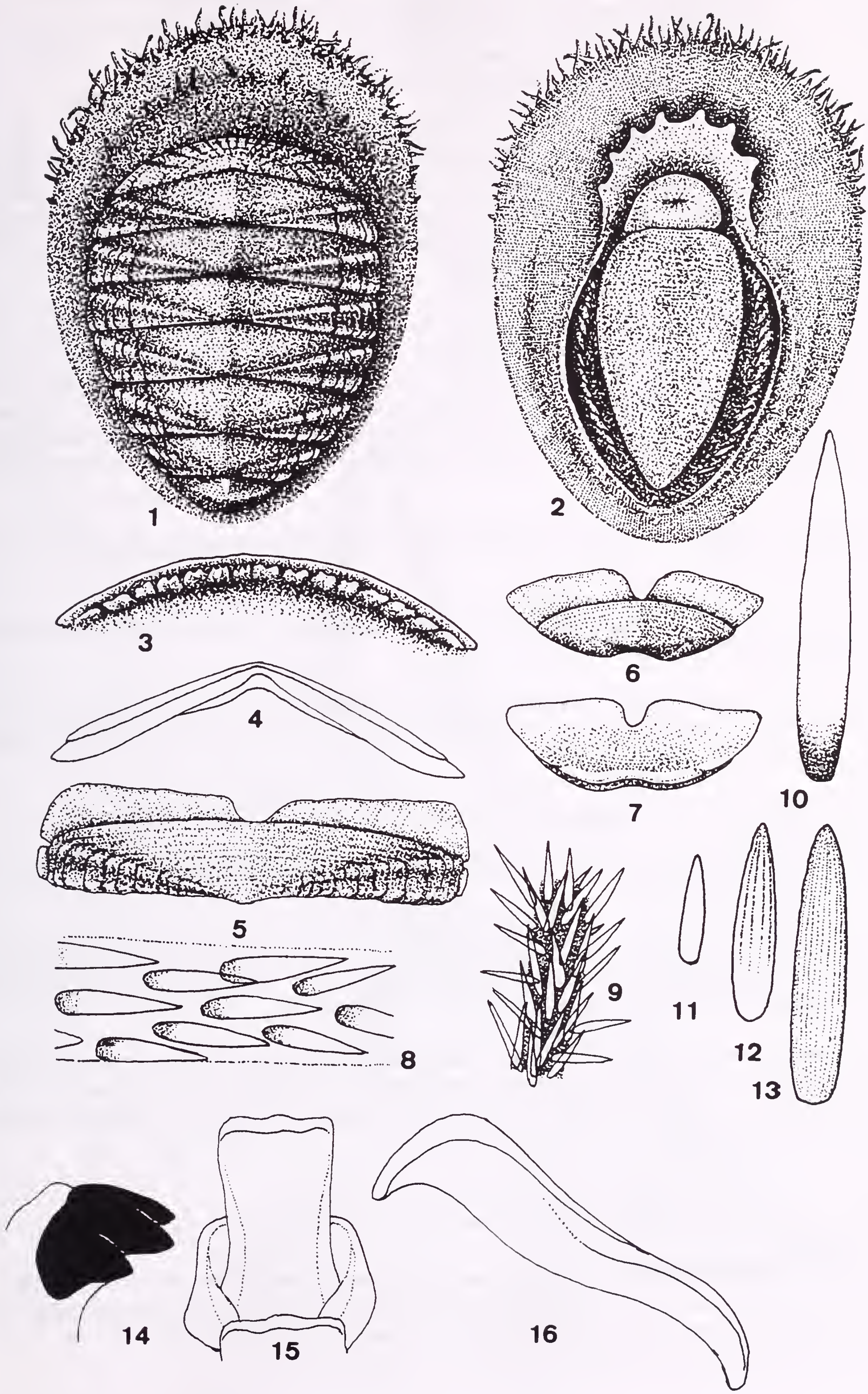
Monograph of Living Chitons, Vol. 5,Page 320.
Piet Kaas and Richard A.Van Belie

MONOGRAPH OF LIVING CHITONS

Placiphorella atlantica (Verrill & Smith).

1, complete specimen, dorsal view, × 2; 2, do, ventral view, × 2; 3, dentition of valve I, × 6; 4, camera lucida sketch of valve V, rostral view, × 4; 5, valve V, dorsal view, × 4; 6, valve VIII, dorsal view, × 4; 7, do, ventral view, × 4; 8, part of dorsal girdle bristle, showing arrangement of spicules, × 80; 9, young (marginal) girdle bristle, × 40; 10, isolated spicule from bristle, × 200; 11, ventral girdle spicule, × 500; 12, dorsal spicule, × 500; 13, marginal spicule, × 500; 14, dental cap of major lateral radula tooth, × 180; 15, central and first lateral radula teeth, × 180; 16, spatulate uncinal tooth, × 180.

1-2, 8-13, specimen from Alaska, Aleutian Islands, off Umnak Id, 228- 274 m (1985), RNC 284b; 3-7, specimen from Alaska, Aleutian Islands, off Attu Id, 130 m, RNC 627b; 14-16, specimen from Alaska, Aleutian Islands, N of Umnak Id, RNC 184.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MARINE BIOTA OF LITTLE BUCKLANDS BEACH TO MUSICK POINT, TAMAKI ESTUARY, AUCKLAND

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SUMMARY

One hundred and eighty eight species, including 142 molluscs (8 chitons, 82 gastropods, 51 bivalves and 1 cephalopod), 5 echinoderms, 11 crustacea (6 crabs, 5 barnacles) 4 polychaetes, 3 coelenterates and 23 seaweeds are recorded from Bucklands Beach, Tamaki Estuary, Auckland. Bucklands Beach has fewer recorded species than at Howick (209 species, including 7 chitons, 90 gastropods, 53 bivalves and 1 scaphopod).

Records and personal observations show that molluscs at Bucklands Beach have suffered severe decreases in diversity and abundance from the 1950's to 2001. These changes are similar to those occurring in the wider Waitemata Harbour. It appears that the main causes are siltation, pollution, especially tributyltin (TBT) and the Imperial Chemical Industries (ICI) fire, loss of habitat and harvesting. The most severely affected area is Little Bucklands Beach, adjacent to the Half Moon Bay Marina. Some of these problems are being addressed by the Tamaki Estuary Task Force.

Musick Point and the adjacent rock platform support the greatest abundance and diversity within the study area.

Sixteen species from Bucklands Beach in the 1950's and 1980's collections or records were not found in the 2001 survey.

The disappearance of the oyster borer *Lepsiella scobina* in the Tamaki Estuary in 1989 is recorded. The numbers of the olive shell *Amalda australis* are increasing after virtually disappearing due to tributyltin TBT.

The polychaete worm *Chaetopterus* sp. is recorded for the first time in the study area.

There is a potential threat of another algal bloom similar to that in the Hauraki Gulf in 2000.

INTRODUCTION

As Bucklands Beach is one of the closest beaches to my home, I have been a frequent visitor during low tides since first becoming interested in shells in the late 1970's. The 2001 study was done during low spring tides between April and November 2001.

No previous detailed studies are known. The pre 2001 lists are incomplete because they were not surveys but compiled from literature, the author's and the Auckland War Memorial Museum collections. The number of crustacea and marine worms in the current list would be increased with specialised study.

Study area (Fig. 1)

The study area is 4 km long on the north east side of the Tamaki Estuary. From south to north it includes:

1. Little Bucklands Beach. The upper part of the beach is shelly sand and cobbles. At lower levels, a wide expanse of gently sloping, soft silty mud is exposed during spring low tides. The rock platform at the southern end of the beach is truncated by Half Moon Bay Marina. Erosion at the northern end is controlled by tiered steps and a gabion wall.

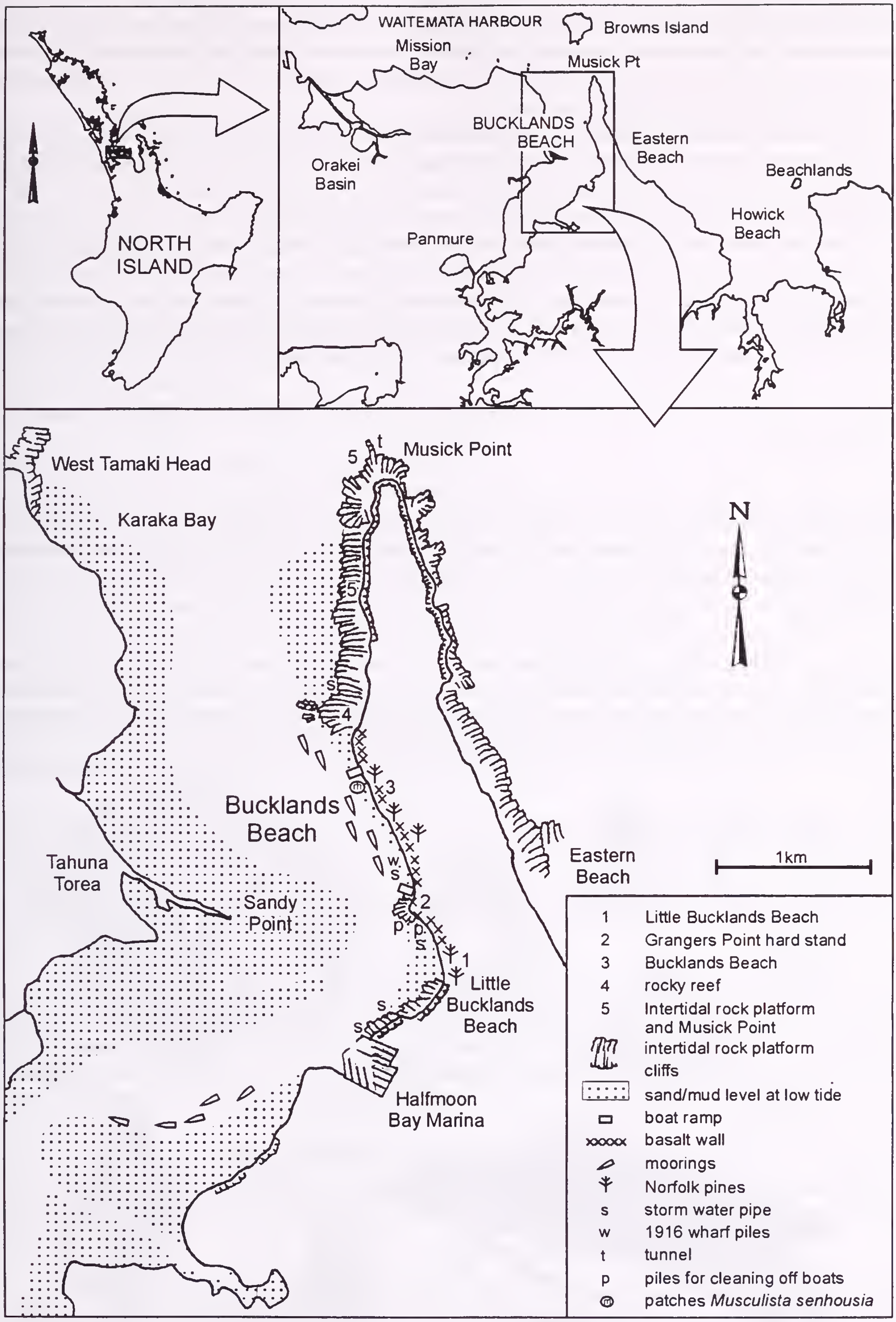

Fig. 1 Sketch map of the study area, Bucklands Beach, Tamaki Estuary

2. Grangers Point is the small rocky headland between Little Bucklands and the main Bucklands Beach. The rocks are Parnell Grit with Waitemata Formation sandstone and mudstone. At low tide the Tahuna Torea spit on the western shore of the estuary is only about one hundred metres across the channel. The Bucklands Beach Yacht Club have reclaimed part of the headland for their hauling out area.
3. The main Bucklands Beach, is composed of coarse shelly gravel. It shelves rapidly to the edge of the channel where many boats are moored close to the beach. There is a central boat ramp.
4. The rocky reef at the northern end of the main Bucklands Beach.
5. The intertidal rock platform north of the reef, and Musick Point. This grades down to wide sand flats which are only exposed at spring low tides. A small rock islet at Musick Point is composed of a thick sandstone layer of Waitemata Formation, it is more resistant to erosion than the adjacent thinner beds. However a 120 year old painting shows that erosion has already claimed one third of the islet's length, more than 15 m (Fairfield 1995).

Mollusc names are updated to Spencer and Willan (1996), Marshall (1998) and Marshall & Burch (2000).

1950's

A mollusc collection made by Arthur White in the 1950's includes 12 species collected at Bucklands Beach. This collection has recently been donated to the Auckland War Memorial Museum (Morley and Hayward 2000). Five of these species were not found in the 2001 survey (Fig. 2).

There was a large bed of green-lipped mussels *Perna canaliculus* at Little Bucklands Beach. Cat's eyes *Turbo smaragdus*, scallops *Pecten novaezelandiae*, cockles *Austrovenus stutchburyi,* little black mussels *Xenostrobus pulex,* oysters and pipi *Paphies australis* were all abundant or

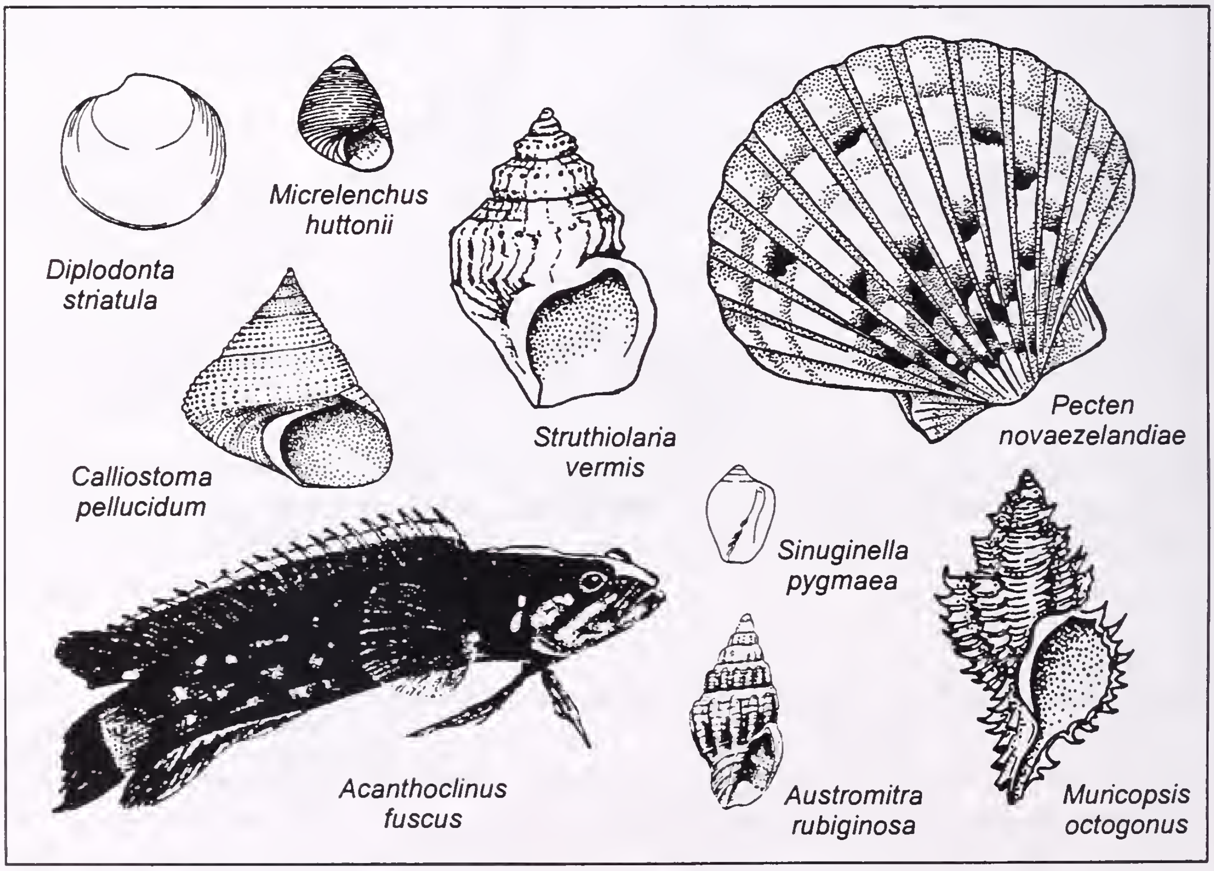

Fig. 2 Some of the species that are no longer present at Bucklands Beach. Drawings by Powell (1987), Morton and Miller (1968) and Margaret Morley.

common (Fairfield 1995, pers. com.). All grew to larger sizes than they do today (Geoff Fairfield pers. com.). Only one small live scallop has been seen in the study area in the last twenty years.

1970's

If only I could visit it now with my additional knowledge! Apart from specimens put in my collection and a few notes, I kept little information. I can remember however the abundance of the olive *Amalda australis* at low tide. It was impossible to walk along the low tide sand without standing on some. All the sand was cross-patterned with their trails as the tide turned.

My children used to delight in finding blennies under every low tide rock. The rockfish *Acanthoclinus fuscus* (Fig. 2) was so common that Pakuranga schools used the population at Grangers Point for biology studies. This fish is not present now. Shrimps were also common but are seldom seen today.

1980's

Asian date mussel *Musculista senhousia* (Fig. 3)
I collected the first specimens of this introduced bivalve in the estuary in August 1982. They were washed up at Farm Cove, Pakuranga in large numbers. Dense beds of *M. senhousia* formed thick mats on the intertidal rock platform just north of Grangers Point in February 1985 (Fig. 1). During 1985-6 the population remained high and occurred in other areas of the estuary. On the edge of the east side of the channel towards Panmure dense mats of *M. senhousia* trapped silt. This provided a suitable stable habitat for a second introduced bivalve *Theora lubrica.*

M. senhousia often die in high summer temperatures but a new recruitment settles elsewhere (Creese et al. 1997, pers. obs.). Neither of these two populations are present near Panmure today, but intermittent populations on Bucklands Beach are indicated by raised beds of accumulated silt, attached dead shells and feeding ducks.

With tuition from Richard Willan, I learnt how to monitor quadrats documenting the early colonisation of *M. senhousia* (Willan 1985, 1987). When a new immigrant arrives there is often an initial population explosion. This was no exception with densities of 3300 per m^2 recorded. The dabs of red paint of the sea wall identifying the site of the quadrats at Grangers Point took many years to erode off!

On one of Richard's visits from Australia we surprised the locals by snorkelling off the main beach in order to sample the density of the subtidal population (Willan 1987). Visibility nil, mud 100%! We succeeded by dragging out great handfuls of thick mats of *M. senhousia* then rearranging and measuring them on the beach out of the water. Each specimen had to be prised out of the tightly woven byssal mat for counting.

Following the arrival of the *M. senhousia* the numbers of the predator murex *Xymene plebeius* increased, although they were not seen actually feeding on *M. senhousia.* One of the specimens grew to a height of 22 mm which equals the maximum measurement for the species (Powell 1979).

At spring tides a population of the small ostrich foot *Struthiolaria vermis* was found by sieving low tidal sand. Specimens were smaller than those further out in the gulf. Despite much sieving, they do not appear to be present at Bucklands Beach today.

The bivalve *Cleidothaerus albidus* attached to the rock platform at Musick Point. The well camouflaged population has been observed until 2000, but numbers are declining and only a few are present today.

A very small but beautiful shell *Sinezona brevis* was washed out of *Corallina officinalis.* The tiger shell *Calliostoma pellucidum* was found by Arthur but has since disappeared. The whelks *Cominella maculosa, C. glandiformis* and their prey pipi *Paphies australis* were abundant but have since decreased in numbers.

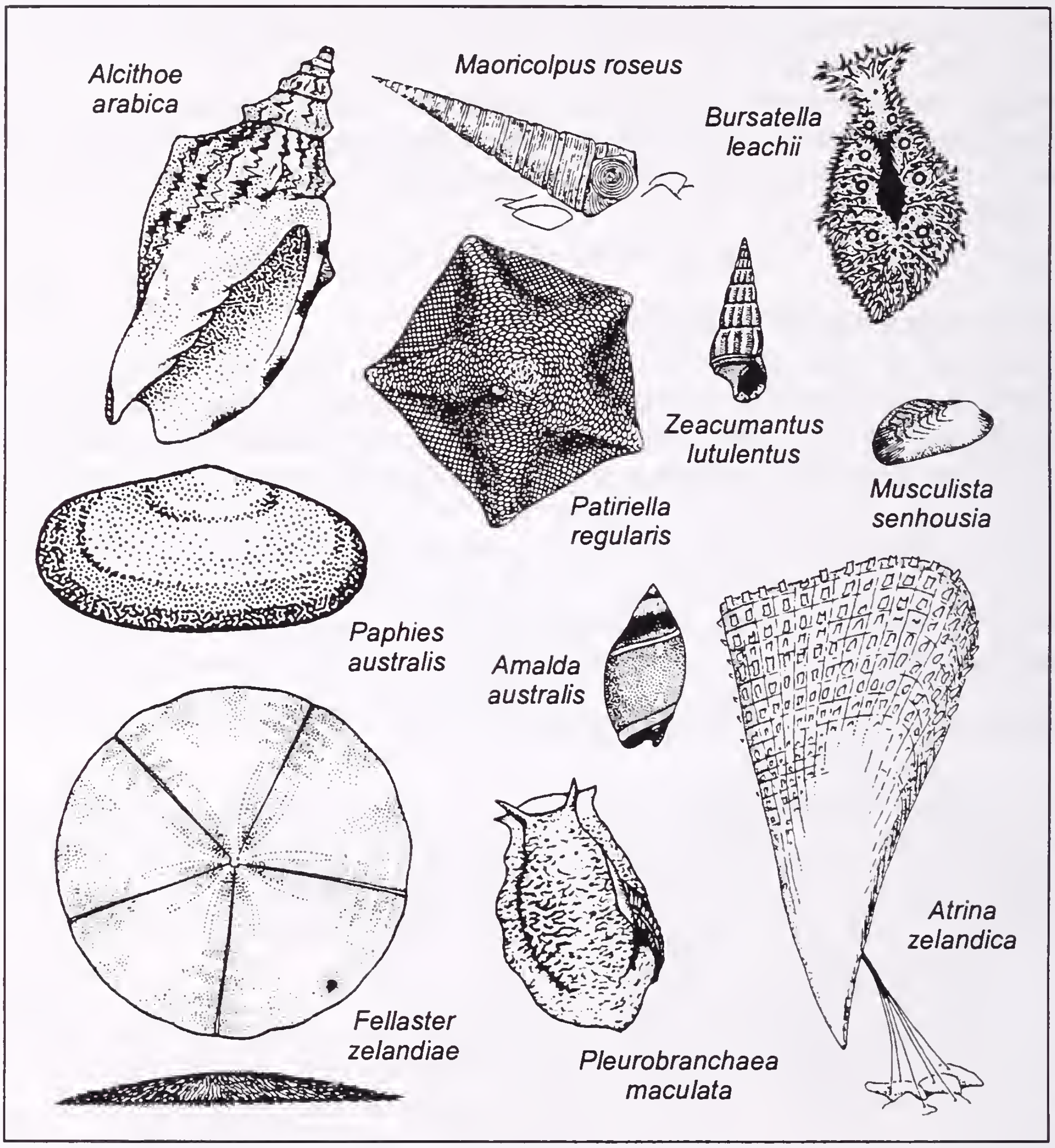

Fig. 3 Typical soft shore species at Bucklands Beach 2001. Drawings by Powell (1987) and Margaret Morley.

Oyster borer *Lepsiella scobina*

Lepsiella scobina was common on mid tidal rocks adjacent to the hauling out area on Grangers Point between Little Bucklands and main beach during monthly studies on *M. senhousia* in 1985-6. The entire population had disappeared by September 1989 (pers. obs.). Studies done in other parts of the Auckland Harbour indicate that this is caused by the biocide tributyltin TBT in antifouling paint. The chemical causes imposex in severe cases preventing reproduction (Stewart et al. 1992). TBT has been shown to accumulate in the sea floor sediments in particularly high concentrations in areas of run-off from boat wash-down sites, under marinas and wharves (Scott 1993).

Imperial Chemical Industries ICI fire

In 1985 there was a fire at the ICI paint factory just south of Panmure Basin. The resulting heavy pollution caused extensive death of biota throughout the estuary. Thousands of opercula and dead shells were thick on the tide line on 6 February 1985 at Farm Cove, Pakuranga. There were huge numbers of the mud snail *Amphibola crenata* and specked whelk *Cominella adspersa*, with some shells of the top shell *Diloma subrostrata*, trochid *Micrelenchus huttonii* (Fig. 2*)*, limpet *Notoacmea helmsi*, ear shell *Marinula filholi*, wentletrap *Epitonium tenellum*, hundreds of,double valves of *M. senhousia*, a few valves of the Pacific oyster *Crassostrea gigas* and the trough shell *Cyclomactra ovata*.

1990's

Live specimens of the small carnivorous gastropod *Chemnitzia bucknilli* were found in trails at low tide. In 1995 a red algal wash from the main Bucklands Beach produced several species of micromolluscs, these were *Eatoniella globosa, Eatonina atomaria, E. micans, Zerotula ammonitoides* and *Linopyrga rugata.* The locally common red alga may have been *Gelidium caulacantheum* which was equally productive in 2001 when the following were obtained from washing this species, *Eatoniella olivacea, E. limbata, Pisinna olivacea impressa, Eatonina atomaria* and *E. micans.*

The green opisthobranch *Elysia maoria* (Fig. 4) was found living on the algae *Codium fragile.* The presence of this species only became evident after taking a plant home for the aquarium. Next day several *E. maoria* were crawling on the glass. I have taken *Codium* home several times since but there have been no *Elysia.*

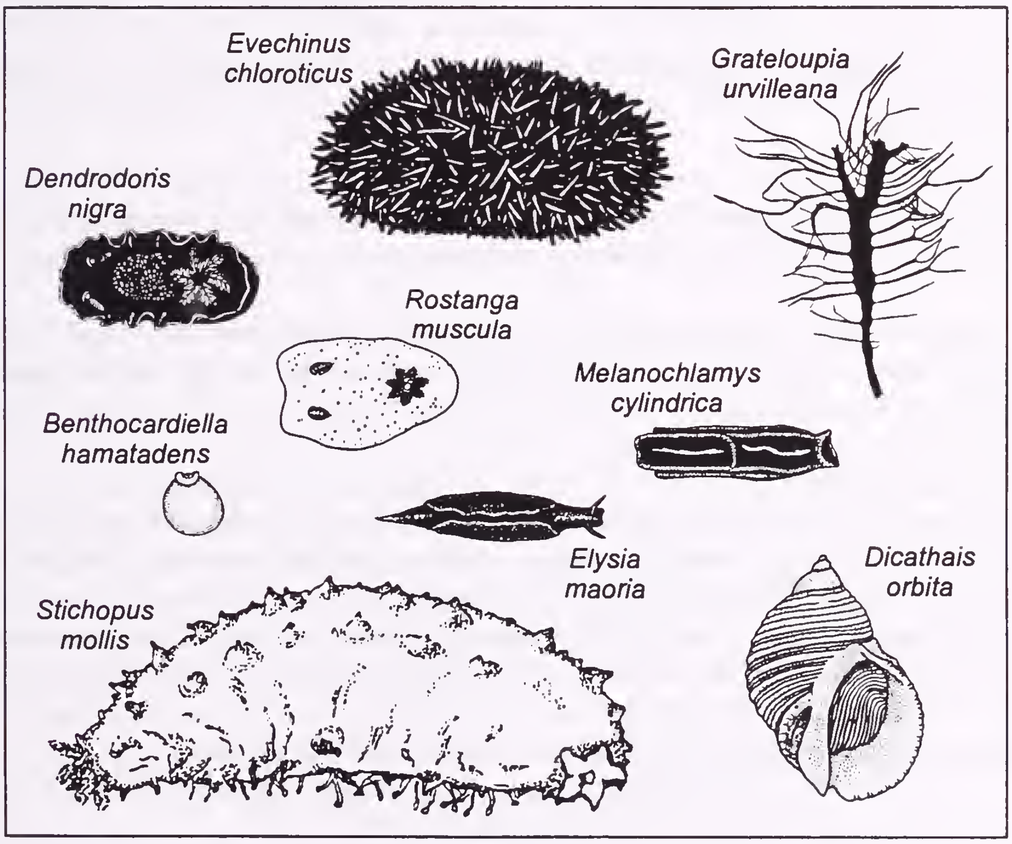

Fig. 4 Some of the species that are rare at Bucklands Beach 2001. Drawings by Powell (1987) and Margaret Morley.

In July 1990 the side-gilled opisthobranch *Pleurobranchaea maculata* together with the sea hare *Bursatella leachii* were common near the reef at the northern end of the beach. They were present again in September 2001, together with many *P. maculata* spawn coils.

Wash ups included valves of *Macomona liliana, Gari convexa,* and *G. lineolata.* The huge valves of *Perna canaliculus* were most likely to be fishermen's' discards from other locations.

SURVEY APRIL- OCTOBER 2001

The fauna at Bucklands Beach varies considerably on different visits. Sometimes it looks quite healthy but on occasions shows signs of severe siltation or oil and petrol spills. Despite chronic pollution problems, pipi *Paphies australis,* Pacific oyster *Crassostrea gigas* and whelk *Cominella adspersa* are harvested.

1. Little Bucklands Beach

This section of the study area was visited on 14 September 2001. A wide Parnell Grit layer is continuous from the low cliff onto the shore platform. Elsewhere the rocks are Waitemata Formation sandstone and siltstone.

The intertidal rock platform at the southern end of the beach has a reduced biota due to chronic pollution. Thick slimy mud covers the rocks. Old pholad borings show on the surface. The Pacific oyster *Crassostrea gigas* (Fig. 5) survives in moderate quantities. Neptune's necklace *Hormosira banksii* grows from the edges of the rock shelf. Specimens of the purple mouthed whelk *Cominella glandiformis,* the top shell *Diloma subrostrata* and slug *Onchidella nigricans* are sparse. Some half crabs *Petrolisthes elongatus* live under rocks. Many of the common intertidal species are noticeably missing. There are no specimens of the periwinkle *Nodilittorina antipodum,* little black mussel *Xenostrobus pulex* or *Chiton glaucus.* The few degraded snakeskin chitons *Sypharochiton pelliserpentis* (Fig. 5) struggle to survive on an outlet pipe among the oysters.

The low numbers of *Melagraphia aethiops* attach to steps towards the middle of the beach. Numerous isopods burrow into a large trunk of driftwood.

At several sections of the beach to the north a layer of pale ash from the Taupo Volcanic Zone muddies the water. A layer of ancient podocarp forest exposed on the surface of the beach is also heavily bored by isopods.

Half Moon Bay Marina

The run-off from the boat hard stand flows directly into the sea. A litter of sandpaper and flakes of paint cover the mud adjacent to the marina boundary. At the northern end of Little Bucklands Beach the sad story is repeated, four piles at low tide are provided for boats to clean off. All the residue of antifouling paint is scraped and hosed off into the sea. The law states that boat owners can discard the attached marine growth into the sea but not the antifouling!! (Pollution hotline pers. com.). Over thirty boats can be pulled out on the hard at Grangers Point for maintenance. It has no bunding so further toxic waste enters the estuary.

2. Grangers Point

It is composed of Parnell Grit and an adjacent rock platform extending to the edge of the channel. Blue banded periwinkles *Nodilittorina antipodum* live on the lower 1.5 m of the basalt wall as well as *Melagraphia aethiops,* scattered *Crassostrea gigas* and *Sypharochiton pelliserpentis* (Fig. 5). Many parts of the horizontal rock platform have no fauna.

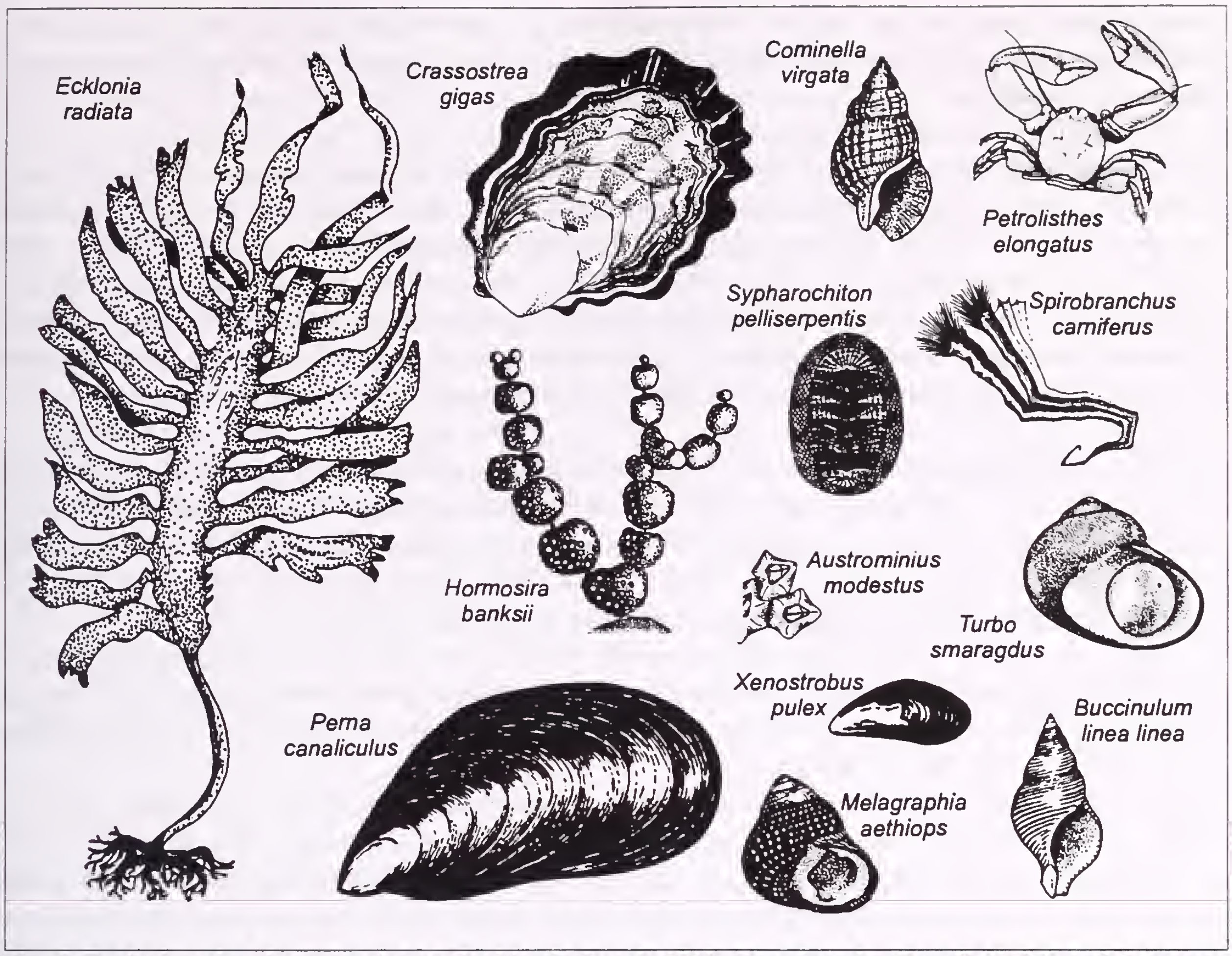

Fig. 5 Typical rocky shore species at Bucklands Beach 2001. Drawings by Powell (1987) and Margaret Morley.

Towards mid beach there are tightly woven clusters of *Xenostrobus pulex.* Scattered specimens of *Crassostrea gigas* become the dominant species on raised areas and at extreme low tide. Tufts and paint of *Corallina officinalis* are commoner lower on the shore.

Brown algae *Carpophyllum maschalocarpum* and *Ecklonia radiata* (Fig. 5) fringe the edge of the reef where it falls away to the channel. There are many species of red and yellow sponges, purple finger sponge, *Aaptos tentum,* yellow spikes of *Halichondria* sp. and compound ascidians. Under low tidal rocks are occasional specimens of the lined whelk *Buccinulum linea linea* (Fig. 5). They have closely spaced fine lines. A rare specimen of tamarillo coloured *Dendrodoris citrina* is sometimes present. Other species include a few *Cryptoconchus porosus,* orange sea squirts *Cnemidocarpa bicornuta,* large *Ischnochiton maorianus*, the solitary coral *Culicia rubeola*, blue ascidian *Asterocarpa coerulea,* less commonly *Leptochiton inquinatus* under rocks and a few large *Perna canaliculus* at extreme low tide. The dark fan of the sabellid worm *Branchioma* sp. withdraws as you approach.

Towards the main beach there is a pipi bed *Paphies australis* and a volute *Alcithoe arabica* (Fig. 3), measuring over 100 mm, buries in the sand with the anterior canal just showing.

3. Main Beach

At the spring tides on 23 August 2001 five double pile stumps of the 1916 wharf (Fig. 1) could be seen opposite Wharf Road.

At high tide during periods of low sand levels large specimens of *Cyclomactra ovata* show on the surface in life position. These may be 4000 year old specimens from when sea levels were 1 m higher than today.

At low tide 100 m to the south of the ramp there are two *M. senhousia* beds measuring 25 m by 10 m. They sit proud above the rest of the beach due to the accumulation of silty mud and attached pieces of shell in the byssal threads. The average shell length is 20 mm. Many predators are attracted to the feast. Blue, green, fawn and orange cushion stars *Patiriella regularis*, the spiny seastar *Coscinasterias muricata,* whelks *Cominella adspersa* and *C. virgata.* The local ducks are often in attendance. The sediment is further stabilised by short fine green algae growing on the mounds of mud, creating a water logged intertidal zone.

The soft spongy patches on top of the *M. senhousia* beds create a habitat for the file shell *Limaria orientalis.* They lie in the hollows with their long orange tentacles bright against the mud. This is the first time I have seen this species in the Tamaki Estuary. Patches of *Paphies australis* live in sand. On most visits a few live *Alcithoe arabica* can be viewed at low tide. Cats eyes *Turbo smaragdus* are common on small rocky points among algae.

A single specimen of the alga *Grateloupia urvilleana* (Fig. 4) was found among the low tidal rocks to the south of the ramp. It has about 12 fronds attached to a stone by a small holdfast. The fronds are very slimy and flaccid.

4. Reef (Fig. 5)

A low narrow reef of volcanic tuff over beach rock extends for 150 m from the sea wall almost to low tide. *Crassostrea gigas* grow on eight short groins which fan out from the basalt wall beside the road. Oyster densities increase towards low tide, the oyster borer *Lepsiella scobina* feed both on these and *Xenostrobus pulex.* A green mossy algae appears in patches at high tide on the groins.

There are many cobbles both on the reef and to each side. These are topped at mid and high tide by the barnacle *Austrominius modestus* and lower on the shore by the spiny tube worm *Spirobranchus cariniferus* (Fig. 5). On the mid tidal platform the horn shell *Zeacumantus subcarinatus* is present in high numbers. The half crab *Petrolisthes elongatus* crowds under rocks. Very large old *Perna canaliculus* (200 mm in height) and *Cyclomactra ovata* valves appear to be eroded from a time of higher sea levels.

On sand adjacent to the north of the reef is a bed of the wedge shell *Macomona liliana.* The lower portion of the reef has some dark overhangs providing habitat for a few golf ball sponges *Tethya aurantium* and ascidians *Pyura rugata.* Among the cobbles at low tide are beds of *Paphies australis* and, rarely seen, their predator *Alcithoe arabica.* At times huge numbers of *Maoricolpus roseus* wash ashore (Fig. 5). In August 2001 there were hundreds of *Bursatella leachii* and *Pleurobranchaea maculata* at low tide. The later were laying transparent coils of spawn.

A surprise find in shell sand was a 5 mm sinistral fresh water gastropod *Glyptophysa variabilis.* This is only the second specimen found in the Tamaki Estuary.

5. Reef to Musick Point (Fig. 5)

This area was studied on 21 September 2001.

High tide At high tide there is a narrow shelly beach overhung by pohutukawa and kowhai trees on the Waitemata cliffs. Some bands of Parnell Grit with inclusions of pale mudstone lenses are

the favoured habitat of *Nodilittorina antipodum* at the base of the cliff. A wide band of eroded sandstone and mudstone forms the intertidal zone. The fast moving crab *Cyclograpsus lavauxi* lives under high tide rocks. *Melagraphia aethiops* cluster around crevices in the upper zone of the rock platform. The dark algae *Apophlaea sinclairii* encrusts the rocks. Many of the crevices are defined by a row of holes in the sand caused by the anemone *Isactinia olivacea* attached to the rock platform beneath. Many small limpets *Notoacmea elongata* and *N. helmsi* graze the algae on dead shells in shallow pools and gutters.

The fine green algae *Rhizoclonium implexum* grows on high and mid tidal rocks. This often washes up at high tide. It is home to many ostracods, amphipods and small species of crabs, eg. *Halicarcinus.* Numerous isopods *Isocladus armatus* burrow into the eroding sandstone. Intriguing concretions in the sandstone provide raised habitat for *Melagraphia aethiops, Spirobranchus cariniferus* and dense *Crassostrea gigas. C. gigas* are the dominant species on a pipe. Those specimens living scattered higher on the shore are squamous ie. they lie flat, those living lower on the shore become crowded and grow vertically.

Austrovenus stutchburyi live in sandy pockets and in sand filled old pholad holes on the rock platform. In adjacent sand there are scattered patches of the wedge shell *Macomona liliana.* The top shell *Diloma subrostrata* are common. Shoals of small fish dart in panic around the shallow pools.

The dark seaweed *Scytothamnus australis* grows sparsely on ridges. Specimens of *Tugali suteri* although small have very thick shells. This may be due to the effects of TBT which causes the shell layers to thicken (Stewart et al. 1992).

Mid tide

Xenostrobus pulex, with accumulated mud in their byssal threads, are common on ridges and on elevated rocks. *Sypharochiton pelliserpentis* are common. *Chiton glaucus* are present under rock slabs in intertidal pools. On mud flats at mid tide crawl abundant *Zeacumantus lutulentus.* Occasional *Cominella glandiformis* are present but nowhere common. The green anemone *Isactinia olivacea* live round the margins of pools. The horn shell *Zeacumantus subcarinatus* is common on intertidal rock. Tube worms *Spirobranchus cariniferus* are the dominant species towards Musick Point forming extensive white zones over 50 m in diameter on the rock platform. In other similar areas *Crassostrea gigas* is the dominant organism. Large bored holes still contain old eroded *Barnea similis* measuring over 100 mm in length.

Low tide

The very low tide made it possible to walk almost to the beacon towards Musick Point. The olive shell *Amalda australis* seems to be making a come back after its devastation in the 1980's. The largest specimens are now 22 mm in height. This is the only time I have seen a specimen of the black nudibranch *Dendrodoris nigra* (Fig. 2) at Bucklands Beach. A few specimens of the black opisthobranch *Melanochlamys cylindrica* (Fig. 2) can be seen at times crawling on the mud. They are intermittently present on the Tahuna Torea sand spit, Glen Innes. They prey on worms, drawing them into their mouths and breaking them up with a strong muscular gizzard (Willan & Morton 1984). It is rare to find a live brown bubble *Bulla quoyii* though spawn can be seen. This species comes out at night. *Cominella virgata* (Fig. 5) is common on low tidal rocks where they congregate in groups of over a 100 specimens on each rock.

At extreme low tide are purple, red and orange sponges. The spiky yellow patches are a species of *Halichondria.* The commonest is a globe sponge *Aaptos tentum.* Ascidians include blue *Asterocarpa coerulea,* brown warty *Pyura rugata* and transparent and pink *Corella eumyota.* The pink barnacle *Notomegabalanus decorus* attach to hard surfaces. The green top shell

Trochus viridis clings with its grey foot to brown algae. *Buccinulum linea linea* are common under rocks, their white egg cases encircle stems of *C. maschalocarpum.* The chiton *Cryptoconchus porosus* is present. *Acanthochitona violacea* with its purple valves embedded in an orange mantle makes a bold statement under rocks. The white rock shell *Dicathais orbita* is rare. The slipper shell *Sigapatella novaezelandiae* is common in holdfasts and on *Perna canaliculus.*

The turrid *Maoricolpus roseus* (Fig. 3) lives among the coarse gravel near the channel. This species is present in old collections but 1998 was the first time I had seen them alive in their habitat at Bucklands Beach. Occasional live horse mussels *Atrina zelandica* live at extreme low tide towards Musick Point. The bivalve *Dosina crebra* is buried in gravelly pockets between rocks.

The cushion star *Patiriella regularis* is uncommon (Fig. 3). The two tubes projecting above the surface of low tide sand indicate the occasional presence of the parchment worm *Chaetopterus* sp.

Ecklonia radiata and *Carpophyllum maschalocarpum* are the common algae at low tide. A soft mass of a dark blue compound ascidian is attached to *C. maschalocarpum.* The green balloons of *Colpomenia peregrina* are common. There are a few red algae eg. *Gigartina livida. Corallina* paint, *Codium convolutum* and dark red algae *Apophloea sinclairii* cover many rock surfaces. Huge clumps of *Codium fragile* over 0.5 m^2 are attached to rocks and discarded icecream containers.

Oyster catchers at low tide feed on *Soletellina siliquens* and *Dosinia subrosea.* Shoals of small fish dart in the low tidal pools.

Musick Point
At low tide it is possible to climb through the tunnel to the outer ledge on the northern side of Musick Point's rocky islet. This is the only place where the water movement is turbulent enough for a scattering of the barnacles *Epopella plicata.* In deep crevices and on flat sandstone faces indurated with limonite, live small clusters of the limpets *Cellana ornata, C. radians,* the slug *Onchidella nigricans* and siphon limpet *Siphonaria australis.* The ledge, margined in brown algae, drops away to deeper water.

The smooth slipper *Crepidula monoxyla* lives in groups on *Perna canaliculus* near the byssal threads. An occasional *Zegalerus tenuis.* lives on dead bivalves. As no live specimens have been seen at Bucklands Beach, the single valve of *Mytilus edulis* probably came from the west side of the Tamaki Estuary at Karaka Bay where there is a small population on the rocky headland (pers. obs.). Only single specimens of the sea cucumber *Stichopus mollis* and kina *Evechinus chloroticus* have been seen.

The kelp *Ecklonia radiata* is common on rocks at extreme low tide off the point. Other common brown algae at low tide are *Carpophyllum maschalocarpum* and *C. plumosum.* A clump of squid eggs attach below low water.

DISCUSSION

Because the pre 2001 Buckland Beach lists were not done as surveys, it is not possible to compare the numbers of species found then, to those in this 2001 survey.

A single day survey on the north east coast of Browns Island done in 2001 records 7 chitons, 70 gastropods and 36 bivalves (pers. obs.). Although these are lower numbers than in this multiple

visit survey at Bucklands Beach, there are more microscopic molluscs. This could be due to less pollution than in the estuary and/or the more exposed habitat.

There is a greatly increased number of species from the intertidal platform north of the reef to Musick Point than from any other site in the 2001 study area (Fig. 1). A total of 149 species are recorded compared to 110 from all the other sites combined. This area is closer to the Tamaki Heads so it could be expected to have more diversity because of increasing salinity and less turbidity. However records show that large populations of *Perna canaliculus* were living at Little Bucklands Beach and scallops *Pecten novaezelandiae* were at the main beach in the 1950's. A second more likely reason is that levels of pollution higher in the estuary are more dispersed at Musick Point.

The Auckland Regional Authority has two stations in the estuary to test water quality. One is near the Panmure bridge in mid estuary and the other off Bucklands Beach. Water quality is also tested in the fresh water of contributing streams. Results show siltation and pollution are greatest in the streams, improving towards Bucklands Beach (Bridget Thompson pers. com.). Sample specimens of mussels *Perna canaliculus* are transplanted into various sites in the estuary. Because they are filter feeders their tissues can later be tested to measure the amounts of contaminants such as heavy metals. It must also be taken into account that there are pollution and siltation problems in the Waitemata Harbour itself (Hayward et al. 1999).

Considerable time, effort and expense is used to address the pollution problems in the Tamaki Estuary. A Task Force set up in 1988 meets several times a year to coordinate the efforts of concerned bodies such as Auckland and Manukau City Councils, tangata whenua, Forest and Bird and the Tamaki Estuary Protection Society.

It is interesting to speculate that the few small valves of *Crassostrea gigas* present in the wash up in 1985 could have been the earliest arrivals in the estuary. It was first recorded in New Zealand in the 1970's (Powell 1979). This species has gradually invaded the estuary and surrounding coast. There were none on the intertidal platform in 1985-6. Today it is a common species on rocks throughout the estuary, especially towards Musick Point.

Effects of tributyltin TBT

Lepsiella scobina disappeared from Grangers Point by September 1989. A few specimens were transplanted to the site in 1990 but they did not survive. None are present upstream of Bucklands Beach in the estuary (pers. obs.). The first specimens towards the sea appear to be a population around the reef. They are common at Browns Island (pers. obs.) and Howick Beach (Morley and Hayward 2000).

The very low tide in September 2001 made it possible to walk across sand flats towards the beacon off Musick Point. The olive shell *Amalda australis* seems to be making a come back after its devastation due to tributyltin in the 1980's (Jones 1992). There are several areas where they are now common. The largest specimens are over 20 mm in height. The usually common white rock shell *Dicathais orbita* is rare at Musick Point. This low population of *D. orbita* only at Musick Point is probably also due to TBT as the species was found to be susceptible by Scott (1992).

Species loss or decreases in abundance

The expected species *Nodilittorina antipodum, Haustrum haustorium, Risellopsis varia* and *Nerita atramentosa* are absent at the reef. Live white bubble shells *Haminoea zelandica* are no longer present at Bucklands Beach but can still be found at Howick Beach (Morley & Hayward 2000). Sixteen species from Bucklands Beach in the 1950's and 1980's collections *Antisolarium*

egenum, Austromitra rubiginosa, Calliostoma pellucidum, Muricopsis octogonus, Micrelenchus huttonii, Neoguraleus sinclairi, Sinezona brevis, Sinuginella pygmaea, Zerotula ammonitoides, Anomia trigonopsis, Benthocardiella hamatadens, Diplodonta striatula, Nucula nitidula, Ostrea lutaria, Solemya parkinsoni, Zenatia acinaces were not found in the 2001 survey. *Paphies australis* and *Austrovenus stutchburyi* were common but both populations and sizes are smaller today.

Even allowing for its small size, less than 1 mm, *Benthocardiella hamatadens*, appears to be a rare species previously only recorded from off Mangonui (Powell 1979). A single whole specimen was found in shell sand in 1986 at Bucklands Beach.

The complex reasons for changes to biota in the wider Waitemata Harbour are discussed in detail by Hayward et al. (1997, 1999). Specific causes in the Tamaki Estuary are the 1985 ICI fire and spillage which caused extensive death of the biota; frequent sewage overflows from substations after heavy rain, leachate from commercial properties, silt from land developments adjacent to the estuary, Half Moon Bay Marina, Grangers Point cleaning off piles and the installation of gabion walls. The latest subdivision at Manor Park had silt traps in place but they were not fully effective because the rhyolitic ash from the Taupo region is very slow to settle. Large amounts got washed into the estuary after rain.

Chaetopterus sp.

Rare specimens of the parchment worm *Chaetopterus* sp. have been seen in low tidal sediments in the past year. It will be interesting to see if the population increases dramatically as has occurred further north (Morley 1999).

Algal bloom

A fine green filamentous algae consisting of a mixture of *Rhizoclonium implexum* and a cyanobacteria, a blue green algae, proved a smelly cocktail for residents and visitors to many east coast beaches last year, including Howick and Bucklands Beach. Piles of rotting seaweed caused a stink for many months (Morley and Hayward 2000). It gradually abated during winter. However when looking at algae under the microscope in September 2001 wisps of the trouble maker are currently epiphytic from high tide to below low tide on all other species. Already moderate quantities are washing in at high tide near Musick Point and at Eastern Beach. The potential is there for the warmer weather to result in another bloom.

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APPENDIX

Species List - Bucklands Beach

a = abundant c = common o = occasional r = rare d = dead x = Auckland Museum collection

	1950's	1980-4	1985-9	1990-5	1995-00	Little Bucklands 2001	Grangers & main 2001	Reef 2001	Reef-Musick Point 2001
Chitons									
Acanthochitona zelandica								o	o
Acanthochitona violacea									o
Chiton glaucus							r		o
Cryptoconchus porosus			r				r		o
Ischnochiton maorianus							o	o	c
Leptochiton inquinatus							r		r
Pseudotonicia cuneata	x						d		
Sypharochiton pelliserpentis						o	c	o	c
Gastropods									
Alcithoe arabica						d	r		
Amalda australis	c	c							c
Amphibola crenata		d				d			d
Anabathron hedleyi									o
Antisolarium egenum	x								
Austromitra rubiginosa	x								
Buccinulum linea linea			o				o	o	c
Buccinulum vittatum			o						r
Bulla quoyii						r			r
Bursatella leachii					a			c	r
Caecum digitulum									r
Calliostoma pellucidum		o x							
Cellana ornata									o
Cellana radians									r
Chemnitzia bucknilli				o					

	1950s	1980-4	1985-9	1990-5	1995-00	Little Bucklands 2001	Grangers & main 2001	Reef 2001	Reef-Mus Point 20
Chemnitzia sp.									o
Cominella adspersa									
Cominella glandiformis			c	o		o	o	o	o
Cominella maculosa			o					o	r
Cominella quoyana								d	
Cominella virgata								o	c
Crepidula costata		o					o		o
Crepidula monoxyla							d		o
Dendrodoris citrina				o			r		
Dendrodoris nigra									r
Dicathais orbita							r		r
Diloma subrostrata						o	d	o	c
Eatoniella globosa			r						
Eatoniella limbata				o			o		o
Eatoniella lutea									o
Eatoniella olivacea				o				c	r
Eatonina atomaria				o				c	o
Eatonina micans				o				c	r
Eatonina subflavescens									o
Elysia maoria				o					
Epitonium tenellum			c					d	
Eulimella levilirata									r
Glyptophysa variabilis			d						d
Haminoea zelandiae		o		o					r
Lepsiella scobina		c	c					c	c
Linopyrga rugata				r					
Maoricolpus roseus	x					d	o	c	c
Marinula filholi	o	o							
Melagraphia aethiops		x	c			o	c	c	c
Melanochlamys cylindrica			o						o
Micrelenchus huttonii			c						
Muricopsis octogonus		d							
Neoguraleus interruptus								d	
Neoguraleus murdochi								d	
Neoguraleus sinclairi		d						d	
Nerita atramentosa						d			d
Nodilittorina antipodum							c		c
Notoacmea elongata									c
Notoacmea helmsi		c							o
Notoacmea subtilis									d
Omalogyra fusca									r
Onchidella nigricans						o	o	o	c
Penion sulcatus					r				d
Pisinna olivacea impressa								o	r
Pisinna zosterophila				o					o
Pleurobranchaea maculata				c				c	o
Risellopsis varia	x								d
Rissoella elongatospira		r							o
Rissoina chathamensis									r
Rostanga muscula							r		
Sigapatella novaezelandiae			o				o	d	o
Sinezona brevis		r							
Sinuginella pygmaea	x								
Siphonaria australis									o
Struthiolaria vermis			o			d			
Trochus tiaratus	x							d	
Trochus viridis							r		o

	1950s	1980-4	1985-9	1990-5	1995-00	Little Bucklands 2001	Grangers & main 2001	Reef 2001	Reef-Musick Point 2001
Tugali suteri									o
Turbo smaragdus	a	c	c	c	c	c	c	c	c
Xymene plebeius			o			d	d	o	d
Zalipais lissa		r							d
Zeacolpus pagoda								d	
Zeacumantus lutulentus				o		d			c
Zeacumantus subcarinatus			c			d	c	c	c
Zegalerus tenuis								d	o
Zemitrella choava	x							d	r
Zerotula ammonitoides				r					
Bivalves									
Anomia trigonopsis	x		d						d
Arthritica bifurca		o							d
Atrina zelandica				o					o
Austrovenus stutchburyi	a	c	c			d	d	o	c
Barnea similis				d			d	d	d
Benthocardiella hamatadens			r						
Cleidothaerus albidus			o	o	o				
Corbula zelandica								d	
Crassostrea gigas						c	c	c	c
Cyclomactra ovata			d			d	d	d	d
Diplodonta striatula	x								
Dosina crebra				o			d		o
Dosinia subrosea			o				d		d
Felaniella zelandica			d						d
Gari convexa					d				
Gari lineolata			d	d					d
Gari stangeri							d		d
Irus elegans				d					
Leptomya retiaria									d
Limaria orientalis								d	o
Macomona liliana							d	o	o
Melliteryx parva									d
Modiolarca impacta									d
Musculista senhousia			a	c	c		c	d	c
Myadora striata			d						d
Mytilus edulis									d
Neolepton antipodum									r
Nucula hartvigiana			c			d	d	d	o
Nucula nitidula			d						
Ostrea lutaria	x		d						
Paphies australis	a		a	c	c	d	d	o	d
Pecten novaezelandiae	c			r			d	d	
Periploma angasi			d						d
Perna canaliculus	a					r	o	o	c
Peronaea gaimardi			d					d	d
Pholadidea tridens									
Pholadidea suteri									
Ruditapes largillierti			d					d	d
Solemya parkinsoni			d						
Soletellina nitida									
Soletellina siliquens			d						d
Tawera spissa				d				d	d
Theora lubrica									d
Tiostrea aupouria?							c		c
Tiostrea lutaria	d								
Tucetona laticostata								d	

	1950s	1980-4	1985-9	1990-5	1995-00	Little Bucklands 2001	Grangers & main 2001	Reef 2001	Reef-Music Point 2001
Venericardia purpurata	x								d
Xenostrobus pulex	a						c	c	c
Zelithophaga truncata									d
Zenatia acinaces			d						
Cephalopoda									
Squid eggs									r
Echinoderms									
Coscinasterias muricata							c	o	o
Evechinus chloroticus									r
Fellaster zelandiae								d	a
Ophionereis fasciata							r		r
Patiriella regularis							o	c	c
Stichopus mollis									r
Crustacea									
Calianassa filholi				o		r			r
Cyclograpus lavauxi									c
Halicarcinus varius								r	r
Hemigrapsus edwardsi									o
Hemigrapus crenulatus						r	r		r
hermit crab								r	
Isocladus armatus									c
isopod in wood						c			
Macrophthalmus hirtipes								o	
Petrolisthes elongatus						c	c	c	c
Pinnotheres atrinocola			x						
Barnacles									
Austrominius modestus						o	c	c	c
Notomegabalanus decorus									c
Balanus trigonus									o
Chamaesipho columna							c		c
Epopella plicata								o	o
Polychaetes									
Chaetopterus sp.								r	r
Spirobranchus cariniferus						o		o	c
Spirorbis sp.							c	c	c
Sabellid worm							r		r
Coelenterates									
Actinothoe albocincta								r	r
Culicia rubeola							r		
Isactinia olivacea							c	c	c
Sponges									
purple finger sponge							r		o
Aaptos tentum							o		c
Tethya aurantium								r	o
Tethya australis									o
Ascidians									
Asterocarpa coerulea									o
Compound ascidian							r		o
Corella eumyota									o
Cnemidocarpa bicornuta									o
Pyura rugosa									o
Styela plicata								o	o
Bryozoa								o	o
Fish									
Acanthoclinus fuscus	c								
Fosterygion varium?									c

	1950s	1980-4	1985-9	1990-5	1995-00	Little Bucklands 2001	Grangers & main 2001	Reef 2001	Reef-Musick Point 2001
Algae									
Apophlaea sinclairii									o
Boodlea mutabile									o
Carpophyllum maschalocarpum							c	o	c
Carpophyllum plumosum									o
Codium convolutum							o	o	o
Codium fragile ssp. *tomentosoides*						r	o	o	o
Colpomenia peregrina							o	o	c
Corallina officinalis						o	o	o	c
Dictyota ocellata									o
Ecklonia radiata							o	o	c
Enteromorpha intestinalis						o			c
Enteromorpha ralfsii?							c		
Enteromorpha ramulosa									o
Gelidium caulacantheum?							o		
Gigartina laingii									c
Grateloupia urvilleana							r		
Hormosira banksii						c	o	o	c
Hydroclathratus clathratus								d	
Petalonia fascia								r	
Plocamium microcladioides								r	
Rhizoclonium implexum						o	o		c
Sargassum sinclairii							o	o	o
Scytothamnus australis								r	o
Cyanobacteria						o	o		c

TWENTY YEARS AGO

From Nancy Smith

In 1980, the Conchology Section's Celebration of its 50th Anniversary was held over Labour weekend. About 100 members from all over the country attended and many spoke to the gathering including Ida Worthy (later Mrs Powell), Lorna Seagar, Noel Gardner, Prof Morton. Sir Charles Fleming thanked Dr. Powell for having started the club and a copy of Sir Charles address was printed. In Poirieria vol.11 no.2 Noel Gardner reported for Poirieria. There were some very interesting photographs reproduced including one of Dr. Powell with three of the original 'boy' members and another of a group of the many members who visited the Douglas home on the Sunday to inspect Norman's wonderful collection.

Also in 1980 The Conchology Section had a trip to Rarotonga and Aitutaki and Joan Coles and Noel Gardner and Derrick Lamb report on the shells collected and seen there, in several articles over the 2 parts of volume 11. These are a very good record of the molluscs in the Cook Islands at that time.

Noel and Norman Gardner shelled and collected fossils on the black sands of Taharoa beach and reported on some of the interesting things seen as well as shells and fossils collected there.

Lucky Rae Sneddon with her family, sailed and shelled in the Whitsunday Islands. Rae collected over 500 species without breaking the rules on live taking, but they did have a tank in which to study and photograph live animals before returning them to the sea.

G. Foreman made a check list of land snails found in Northern Hawkes Bay Coastal Forest, and Helen Stewart talked about landsnailing in Australia.

Prof. Morton took a series of coastal walks in the Devonport area, and an Ecology Field course in Fiji, reported by Margaret Morley and Fiona Thompson respectively.

In Great Exhibition Bay in May a big washup after stormy weather was closely inspected by Mr. And Mrs. R.A. Cumber and flocks of persistent seagulls. Among hundreds of thousands of good sized Atrina, they found some very interesting shells and other flotsam. They also noted near the river mouth, oyster catchers digging out young toheroa. If you want to know how your visuopsychic area helps you find rare shells, read Margaret Morley in vol.11, pt 1.

MAHIA PENINSULA TRIP

A personal account by Betty Headford

Members on the trip Gladys Goulstone, Hugh Grenfell, Bruce Haywood, Betty Headford, Neville Hudson, Margaret & Con Morley, Nancy Smith, Doug & Judy Snook, Glenys Stace, Fiona & Peter Thompson, Rosa & Richard Tyson. We Stayed at the Blue Bay Holiday Resort, Opoutama, Mahia. The Mahia trip was just fabulous. A relaxing break and yet we did so much, found fascinating things and places and met interesting people. We left Auckland just after 7 - Glenys (driving us in her van) Nancy, Gladys & I and headed for Ngatea and the Copper Kettle for breakfast. We were sidetracked in the Karangahake Gorge to look at the wonderful sight of waterfalls in full volume, before heading on towards Tauranga.We were waylaid in Bethlehem at Bay Blooms Nursery to admire the many lustrous irises and multitude of other colourful perrennials.

A late lunch on Ohiwa beach, sounded a great idea. A sunny day and perfect setting; were fatal timewise. An hour and a half of happy beachcombing passed and Nancy found an epitomium. There may be only one on the beach but she'll find it. We slowly travelled one of the most beautiful coast roads (especially when the Pohutukawa is in bloom) to stop briefly in Opotiki. Then I drove through the Waioeka Gorge to Gisborne. The clematis and kowhai all through the hills were a delight.

We arrived at Wairakaia Station, Rodney & Sarah Faulkner's place, in time for a cup of tea - about 5pm. Then we helped pack the picnic basket and headed off to their private little beach south of Young Nicks Head. It's a wild and beautiful beach with only a few banded dotterels and pied oyster-catchers patrolling its strands. Friends Paul & Joan Pollock joined us and Pauls new yearling steers talked to us over the fence. We dined on a scrumptuous BBQ – steaks, salads, cheeses and wine and much later drove home under a very starry sky.

Very bright and early next morning, Glenys our "owl" astounded everyone by dashing up the hill to photograph the dawn. That was her early start for the trip! We wandered around Sarah and Rodney's lovely big garden before we drove out to Ngatapa to Eastwood Hill Arboretum where we spent most of the day awed by the number and size of the trees, the colour, texture and patterns of leaves and the mass of spring blossom. It took vision and a lot of hard work to turn a dream into this wonderful reality.

By 4pm we were all worn off at the knees and treed out so it was off to Morere Hot Springs on our way to Mahia. But we timed it wrong arriving about 4.30 – they close at 5 - and no time to walk up to the Nikau pools for a swim. To assuage our disappointment and judging our interest botanical the proprietor kindly let us in to look at the Nikau Grove, about the best in NZ. And I ran out of film!

So it was off to the Mahia Peninsula and to the Blue Bay Camp Ground to meet up with the other 11 Club members and settle into the Blue Bus, our accommodation for the next four nights. It was all newly done up with all mod cons and 20 feet away from the beach with a stunning view of the bay. What more could you ask for! Bruce, Margaret and Hugh were already out in the bay dredging and the others drifted in as they returned from their little expeditions to surrounding beaches.

The next morning I awoke to look out my window at the surrounding pine trees "on fire." Out of bed in a flash and off to photograph the stunning sunrise (Which I did the next day too) then I beachcombed till breakfast. Amazing how many others all had the same idea. That day we explored several other beaches. On Oraka Beach we found lovely big specimens of Mactra discors, lots of Spisula aequilatera and Cookia sulcata but only halves of big Resania lanceolata.

We were meeting for lunch and low tide at a beach on the east side of the peninsula, Taiporutu Beach, about the only one, one can get to on that side. After a bit of a hassle with the locals and locked gates we eventually got the right gate, drove across a paddock to the beach and found the others already avidly collecting. The beach was strewn with big round boulders like giant marbles and around the headland was a fabulous example of folded mudstones on a grand scale. Richard learnt how to catch butterflies and chased common copper butterflies and other insects for Neville's collection. It was such a beautiful place. After the zealous hard work collecting it was a perfect setting for a cup of tea sitting friends and chatting about our finds while admiring the view.

To round off a perfect day we drove down the east side of the peninsula to see if we could get right to the end. I'd encountered locked gates on a previous visit, but this time we were in luck and with pushy yours truly and Neville getting sent in to do the negotiating at the farms - we got there. We needed the 4WD even then we had to walk the last couple of kms, but it was worth it. The view was stunning - standing on the clifftop that angled down like a turtle's tail to a deep channel that separated us from Portland Island, a raised sea platform. We walked down the steep track to the beach where Glenys found the find of the trip - a perfect paper nautilus

shell, about 6 or 7 inches across. Neville kept saying it would be perfect if we found two. We collected madly for Bruce and Margaret's species list as we knew we were most unlikely to return. We were lucky to get there. Then it was time to take the long trek up the cliff track to get out before dark. Glenys manoeuvred some hair-raising tracks to get us back on the homeward road which ran along a high ridge with breathtaking drops and views. Quite stunning scenery. Oh and my camera battery died. B..ger!

Our 2nd day we took it easy in the morning, cleaning, sorting and identifying our finds. I discovered our wonderful little country camping ground carried all sorts of camera equipment AND Batteries. We went off to Whangawehi beach and reef for low tide. I was able to photograph all the fabulous things we found. Glenys and Neville went snorkelling. The rest of us were content to paddle and turn over rocks etc. Neville found a beautiful yellow seahorse about 6 inches long. His little tail kept curling around fingers or seaweed. We found octopus and scutus, ranging from tiny to big 4-5 inches long and about 2 inches high. There were sea worms, chitons with all sorts of patterns and colours, kina, paua, crabs of many types, brittlestars, lots of fish, citrina nudibranchs and of course lots of molluscs. Can't wait to get the photos back.

The tide came in and put an end to our fun. While we were recouperating and having a "cuppa", the lady in the house opposite came to ask us if we'd like to look through her garden, small but packed with all sorts of perennials, huge roses and many succulents. Marli Bell sold cosmetics as a side-line. She thought Glenys was our "tour" leader which Glenys got lots of chivvying about. That night we all bought our dinners and wine and grouped around one of the banquet-type BBQ tables. Carol Cullen a Mahia resident and Wellington Shell Club member joined us for another good night.

Our last day we crammed in as much as we could. Bruce, Margaret, and Hugh went off with the boat once more to explore the western side of the peninsula. Others went to their favourite beaches or fishing. Nancy went off hunting bugs and beetles with Neville. Glenys, Gladys and I went to the Nikau Grove and hot pools at Morere. (This time with film) We had a lovely soak under the trees with the tuis, grey warblers, fantails and pigeons flying over and around us. Soaked in the warm pool plunged in the COLD pool, boiled in the hot pool and plunged once more into the cold pool. WOW But it felt good afterwards. And you guessed it - lots of photos of nikaus and ferns. Back to camp for a quick lunch and catch up with the others and then most of us went back to a different reef at Whangawehi.

There were more wonderful finds of different starfish and some strange creatures - wandering sea anemones, Phlyctenactis tuberculosa. They are like curled ruched chiffon at one end (Thats the grab & hang onto seaweed end) and tentacles like a normal anemone at the other while the central tube of 2-3 inches in diameter looks like miniture bubble plastic and feels like silky jelly. The colour varied in the ones we found from soft grey green to sand to a really rusty brown one. They were about 6-7 inches long.

When the tide beat us back to shore we headed up to Mahanga beach, a long windswept ocean beach and walked what seemed like kms. We were "kinda" bushed after all that activity and decided to try the camp shop. Biggest best hamburgers we've had in years. No room for chips! Then it was sort and pack all our finds ready to leave next morning. There were lots of last minute consultations on identifications and making sure nothing was missed off the species lists.

Our trip home was through Waikaremoana. It was drisly with showers and clear patches. But that was okay. It was moody and atmospheric. The clematis and kowhais were masses of bloom. I haven't seen the Pittosporum eugenoides with so much bloom or the bush lawyer and the wonderful beeches laden with so many flowers. The light drizzle was not conducive to bushwalking but I semi bullied the girls into taking the walk down by the waterfalls through the bush. It cleared momentarily so we set off. The ferns and lichens and mosses and epyphites were just stunning, as were the waterfalls. The little communities of plants calendar material. Do hope my photos do it some justice. We got wet but it was definitely worth it.We found some stunning clematises and later in the Ureweras Clematis foetida, a scented yellow one. Is it always raining in the Ureweras?

In Rotorua the cornus (dogwoods) planted down the main street were stunning, But when we got to my friend Jill's we all gasped at the magnificent balcony covered in white and purple wisteria and the deck awash with clematis montana rubens.

We awoke to a sunny day, good for walking around the Hamilton Botanic Gardens. They are beautiful especially now with the spring bloom in full flush.

Well it may seem as if it was more of a botanical trip than a conchology trip but I can assure you the species lists that Bruce and Margaret & Hugh were compiling with everyone aiding and abetting were pretty long and full. Those beaches got a thorough combing. And we all enjoyed ourselves as well. Unfortunately for most of us its now back to work and reality…… well until the next trip.

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MARINE BIOTA OF RAGLAN, WAIKATO WEST COAST

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SUMMARY

351 species (including 116 gastropods, 63 bivalves, 47 polychaetes, 22 crabs and shrimps, 20 seaweeds, 12 amphipods, 11 echinoderms, 11 chitons, 10 sea anemones, 9 sponges, and 6 barnacles) of intertidal and subtidal organisms are recorded from the previously little-studied coast inside and outside Raglan Harbour, Waikato. We provide the first west coast records of 15 mollusc species and the southernmost record in New Zealand of a further two gastropods.

The habitat with the greatest diversity is the partly sheltered stable boulder and basalt platform shore around Whale Bay (104 living species), followed by the moderately sheltered intertidal lagoon at Whale Bay, the limestone rocky shore on the north side of Raglan Harbour, and the shelly sediment of Raglan Harbour channel (65-70 living species each). Of medium diversity is the clean fine sand offshore (10-20 m depth) from the harbour entrance (46 living species) and the intertidal sand and mud beaches around the Raglan Harbour's shoreline (30 species). The most exposed, wave-battered rocky shore at Papanui Point has a particularly low diversity (23 species) intertidal fauna, but more profuse than the mobile sand substrate of the shallow subtidal (4-6 m depth) offshore surf zone (16 species), and beaches just inside Raglan Harbour entrance (12 species) and on the open coast (1 living species).

INTRODUCTION

This study is one of several recently undertaken by the authors to document the poorly known diversity and biogeographic distribution of intertidal and shallow subtidal organisms along the west coast of the North Island of New Zealand. Until recently the only published accounts of the diversity and ecological distribution patterns of the intertidal marine biota along this stretch of coast from New Plymouth to Cape Maria van Dieman were from various parts of the large Manukau Harbour, west Auckland (Powell 1937, Grange 1979, 1982, Henriques 1980), from the rocky coast at Kawerua, south of Hokianga Harbour mouth (Hayward 1971, 1974, 1975, 1979, 1981, 1990, Hayward & Hayward 1974, 1991), and from north Taranaki (Miller 1974).

Our 1990s survey along the West Coast involved the following studies (from north to south):

1. Ahipara and Herekino Harbour (Hayward et al. in prep.);
2. Whangape Harbour (Hayward et al. 1994);
3. Waimamaku Estuary (Hayward & Hollis 1993);
4. Kawerua molluscs revision (Hayward et al. 1995);
5. Waitakere Ranges (Hayward & Morley in press);
6. Kawhia Harbour area (Morley et al. 1997);
7. Awakino to New Plymouth, north Taranaki (Hayward et al. 1999).

This study at Raglan provides further biogeographic information on the marine biota along the west coast of the North Island, from an area part way between previous studies on the coast of the Waitakere Ranges and Manukau Harbour in the north and Kawhia Harbour in the south (Fig. 1).

Raglan Harbour

Raglan Harbour (37° 48'S, 174° 52'E) is a drowned river valley system extending c.10 km inland from its mouth on the Waikato west coast. Like most west coast harbours it has a deep central channel extending up the axial arm with extensive intertidal and shallow subtidal flats on either side and up the many tributary arms. Inside the harbour entrance, where tidal flows are particularly strong, the channel is up to 20 m deep and is floored by clean medium sand. Between 2 and 4 km inside the harbour, adjacent to Raglan township, the channel sediment is shelly sand to sandy shell gravel. Moving up the harbour the channel shallows, narrows and its sediment fines through fine sand to sandy mud.

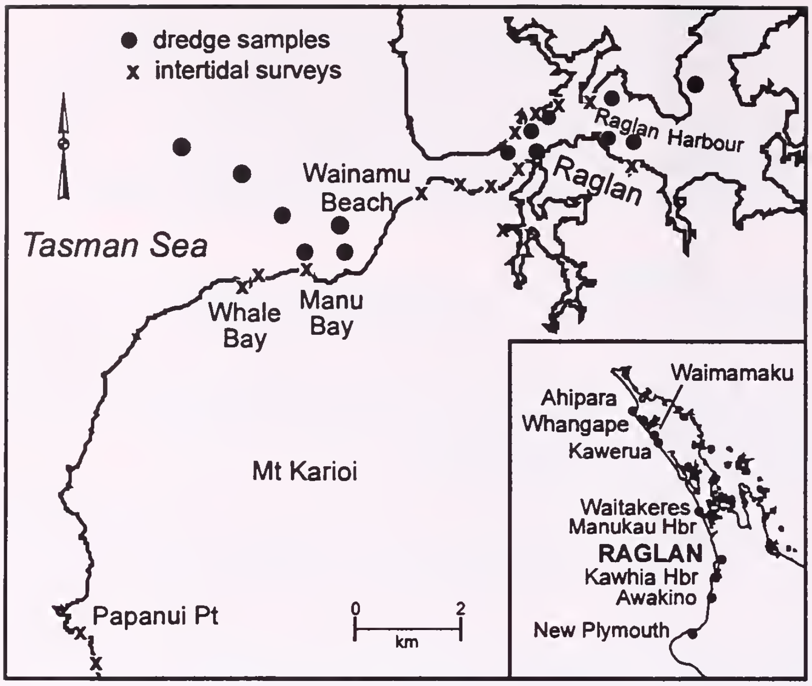


Fig. 1. Study areas around the Raglan coast on the west coast of the North Island, New Zealand.

The first 1.5-2 km of the harbour entrance is flanked by clean sandy beach, with Wainamu Beach on the southern shore. Inside this, the harbour coast is a blend of rocky shore platforms backed by low cliffs on the points, separated by intertidal mud flats and high tidal muddy sand beaches in the bays and arms. The rocky coast of Raglan Harbour is a mix of greywacke, calcareous mudstone and more erosion resistant crystalline limestone. Most of the rocky shore examined by us on the north side of the harbour opposite Raglan township was composed of crystalline Te Kuiti Group limestone (Waterhouse & White 1994).

Small areas of salt meadow and salt marsh are present at high tide around the fringes of the harbour. A single, small mangrove bush (*Avicennia maritima*) grows on the muddy foreshore on the outskirts of Raglan township - possibly the southernmost mangrove plant on New Zealand's west coast.

Exposed beaches

Two exposed sandy surf beaches were examined, largely to document the presence of molluscs that live offshore and whose shells are cast up on the beach. The beaches, one north (Ngarunui Beach) and one south (Ruapuke Beach) of the rocky shore of Mt Karioi (Fig. 1), are both backed by coastal sand dunes.

Exposed rocky shoreline

Mt Karioi is a large, partly eroded, Pliocene volcano that forms a high southern backdrop to Raglan. Its western slopes of basaltic lava flows and breccias, jut out into the Tasman Sea, forming 10 km of high cliffs, rocky shorelines and boulder beaches between Manu Bay and Papanui Pt (Fig. 1). We surveyed this rocky shore at its southern and northern ends. The huge basalt blocks and sheer cliffs at Papanui Point in the south are exposed to the full force of the Tasman Sea swells and storms. The north-facing Karioi shoreline around Manu and Whale Bays however, is relatively more sheltered with the dominant south-westerly swells and surf running nearly parallel to the coast. This northern coast is largely composed of a relatively steep, mostly stable boulder shoreline interspersed with short sections of lava flow shore platform.

At Whale Bay, the boulders form a breached spit across the seaward side of a small embayment (200 m across). In behind the breached spit is a shallow (0-1 m deep) mid tidal lagoon, floored with rock and sand and littered with cobbles and boulders. A small, relatively sheltered sandy beach is present on the landward side of the lagoon.

Offshore seafloor

Off the mouth of Raglan Harbour the seafloor slopes gently away to the west and is draped in clean medium sand down to a depth of about 10m, with clean fine sand further out, at least down to a depth of 20 m, 3 km offshore.

Methods and voucher specimens

This paper records all marine molluscs, polychaetes, echinoderms and algae, plus some members of other groups, that were found inside Raglan Harbour and along a 10 km length of exposed coastline south of the harbour mouth (Fig. 1) on a three day field trip by the first five named authors during a period of spring low tides (0 - 0.2 m low tides) in April 1998. Field work included extensive intertidal searching of the range of habitats present along the harbour and exposed coast, beach combing along the shore and a number of dredge hauls of sediment from the subtidal bed of Raglan Harbour and from the sea floor (20 m depth), up to 3 km off the entrance to Raglan Harbour (Fig. 1). Dredge samples were passed through a 1 mm sieve and all live animals retained were later picked and identified. Samples of low tidal seaweed and specimens from the underside and sediment beneath cobbles on several reefs were also taken and the associated biota picked and identified. Specific detail on dredge samples and intertidal study sites is presented in appendix 1.

Most records are supported by voucher specimens in the Marine and Botany Departments' collections of the Auckland War Memorial Museum (AK).

SPECIES LIST

Mollusc nomenclature follows Spencer and Willan (1996) and Marshall (1998).

Habitat where found:
A = exposed intertidal rocky shores
B = Whale Bay intertidal lagoon
C = exposed sandy beach
D = offshore subtidal seafloor
E = harbour entrance sand beach
F = subtidal harbour channel
G = intertidal harbour rocks
H = intertidal harbour soft shores

Qualitative assessment of abundance:
a = abundant
c = common
f = frequent
o = occasional
r = rare
d = only seen dead

* = apparent extension of recorded range

	A	B	C	D	E	F	G	H
MOLLUSCA: POLYPLACOPHORA - CHITONS								
Acanthochitona violacea							r	
Acanthochitona zelandica	c						o	
Chiton glaucus	r						f	
Cryptoconchus porosus	r						f	
Eudoxochiton nobilis	o							
Ischnochiton maorianus	f					r		
Leptochiton inquinatus	o					r		
Onithochiton neglectus neglectus	d							
Plaxiphora murdochi	r							
Plaxiphora obtecta	r							
Sypharochiton pelliserpentis	c						c	
MOLLUSCA: GASTROPODA - SNAILS								
Alcithoe arabica					d			
Amalda australis				f	f	r		d
Amalda mucronata			d	o				
Amalda novaezelandiae				o				
Amphibola crenata	d	d				d		a
Amphithalamus semen	c				d			
Argobuccinum pustulosum tumidum					d			
Asteracmea suteri		r						
Austrofusus glans					d			d
Austromitra rubiginosa	r	r				d	d	
**Brookula finlayi*					d			
Buccinulum linea linea						d	r	
**Buccinulum robustum*		d						
**Buccinulum pertinax pertinax*	r							
Buccinulum vittatum	o							
Cabestana spengleri					d			
Caecum digitulum					d			
Calliostoma punctulatum	d						r	
Cantharidella tesselata	c	d		d	d			
Cellana ornata	o						o	
Cellana radians	a	a		d				
Chemnitzia spp.				r	d		d	d
Cominella adspersa	r	r			f		f	
Cominella glandiformis		r			d	d		r
Cominella maculosa		o			d	d		d
Cominella quoyana					d	d	d	r
Cookia sulcata	r						r	
Cymatium parthenopeum					d		o	
Dendrodoris citrina							r	
Dicathais orbita	o				d		o	
Diloma arida						d		
Diloma bicanaliculata	f	f						
Diloma nigerrima		d						
Diloma subrostrata					d	d		c
Diloma zelandica	c	c					o	
Doriopsis flabellifera		r					r	
Eatoniella albocolumella					d			
**Eatoniella globosa*					d			
Eatoniella latebricola	d							
Eatoniella limbata						d	f	
**Eatoniella notata*							d	
Eatoniella olivacea	o	d				d	r	
**Eatoniella roseospira*		d						
Eatonina atomaria	r						c	
**Eatonina subflavescens*	r							

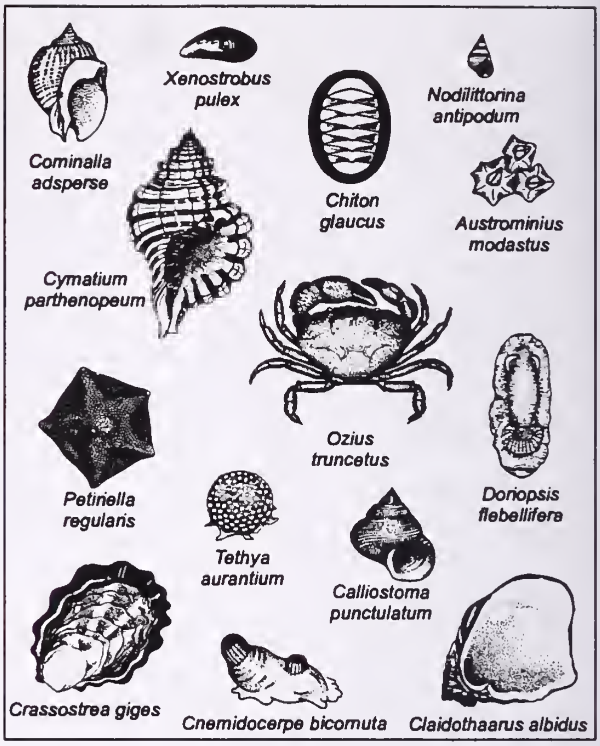
	A	B	C	D	E	F	G	H
Epitonium jukesianum	d	d			d			
Epitonium tenellum					d			
**Eulima perspicua*					d			
Eulimella levilirata		d				d		
Gadinia conica	d	d						
Haliotis australis	r							
Haliotis iris	f							
Haliotis virginea		o						
Haustrum haustorium		d						
**Incisura lytteltonensis*					d			
Lepsiella albomarginata	a						o	
Leuconopsis obsoleta		d			d		d	
Linopyrga rugata					d	d	d	
Maoricolpus roseus manukauensis					d	a		
Marinula filholi		d						
Melagraphia aethiops	r							
**Merelina lyalliana*		d			d			
Micrelenchus sanguineus sanguineus	c	d						
Micrelenchus huttonii				d	d	d		c
Neoguraleus murdochi					d	d		
Nerita atramentosa	r	o						
Nodilittorina antipodum	c	c					c	
Nodilittorina cincta	r							
Notoacmea elongata		d					r	
Notoacmea helmsi	o			d		d	d	o
Notoacmea pileopsis pileopsis		o						
Notoacmea helmsi (scapha form)					d			
**Odostomia takapunaensis*		d			d	d		
**Odostomia ?vestalis*					d			
Onchidella nigricans	f							
**Ophicardellus costellaris*					d			d
Orbitestella parva							o	
Paratrophon cheesemani	r			d	d			
Patelloida corticata	c							
Penion sulcatus	d							
Pervicacia tristis				f	d	d		
Phenatoma zealandica				d				
Philine auriformis					d			
**Pisinna olivacea impressa*							r	
Pisinna zosterophila	r	d			d	d		
Potamopyrgus estuarinus								d
**Pupa kirki*				o				
**Pusillina latiambita*					d		d	
Radiacmea inconspicua	o							
Risellopsis varia	f	d			d		d	
Rissoina chathamensis	o	f				d	d	
Scutus breviculus	o	o						
Semicassis pyrum					d			
Sigapatella novaezelandiae				d		d		
Sinezona brevis					d			
Siphonaria australis	f			d		d		
Siphonaria propria		d						
Struthiolaria papulosa					d			
Trochus tiaratus					d	d		
Trochus viridis	r							
Tugali suteri		f						
Turbo smaragdus	f	f			d	o		
Xymene plebeius					d	d	d	o
Xymene traversi	r							
Zaclys murdochi							d	
**Zalipais lissa*	o				d			
Zeacalpus vittatus				d		d		
Zeacumantus lutulentus					d	d		o
Zeacumantus subcarinatus	o	f				d		
Zegalerus tenuis				d		f		
Zemitrella choava	r	o				d	d	
Zemitrella pseudomarginata						d		
Zethalia zelandica					c	f		
MOLLUSCA: BIVALVIA								
**Acar sociella*					d		d	
Anomia trigonopsis		r		d		d	d	
Arthritica bifurca					d	o	d	d
Atrina zelandica					o			o
Austrovenus stutchburyi	d	d		d	d	d		a
Bankia australis					d		d	
Barbatia novaezelandiae		r			d			
Barnea similis					d	d		
Bassina yatei					d			
Borniala reniformis	r	d				d	d	
**Cardita aoteana*		d						
Chlamys zelandiae	o	d		d	d	d		
Cleidothaerus albidus						d	o	
Corbula zelandica						o		
Crassostrea gigas		o			d	d	c	
Cyclomactra ovata					d			

	A	B	C	D	E	F	G	H
Diplodonta globus	d				d			
Divaricella huttoniana				d	d	r		
Dosina zelandica		d	d		d	f		d
Dosinia anus				d	d			
Dosinia subrosea				r	o	d		
Felaniella zelandica		d				r		d
**Gaimardia finlayi*					d			
Gari lineolata			d					
Gari stangeri		d	d		d	o		
Hiatella arctica	r	d			d	d	d	
Irus reflexus	o						o	
Kellia cycladiformis		r					d	
Lasaea hinemoa		d			d		d	
Leptomya retiaria	d	d		d		f	d	d
Macomona liliana		o			f			c
Mactra murchisoni			d		d			
Maorimactra ordinaria			d	d				
Modiolarca impacta		r			d	d	d	
Modiolus areolatus	d							
**Myadora antipodum*				f		d		
Myadora boltoni					d			
Myadora striata				f	f	d		
Mylitella vivens vivens					o			d
Nucula hartvigiana	d	o			d	c		f
Nucula nitidula				c	d			
Ostrea lutaria						d		
Paphies australis		d		d	d	d		c
Paphies donacina			d	o	d			
Paphies subtriangulata			d		d			
Pecten novaezelandiae			d		d	d		
Perna canaliculus	r			d	d	d	o	
Peronaea gaimardi			d		d			
Pholadidea suteri							f	
Pododesmus zelandicus							d	
Protothaca crassicosta		r						
Pseudoarcopagia disculus	d	o				o		
Resania lanceolata			d		d			
Ruditapes largillierti	r		d	d	d	f		
Scalpomactra scalpellum			d	d		d		
**Soletellina nitida*					d	d		
Spisula aequilatera			d	d	d			
Tawera spissa		d	d	d		o		
Tellinota edgari			d	d	d			
Theora lubrica					f	o		f
Trichomusculus barbatus							d	
Xenostrobus pulex	r?	o	d	d	d	d	f	
Zelithophaga truncata						d	f	
MOLLUSCA: SCAPHOPODA - TUSK SHELLS								
Antalis nana				o		r		
MOLLUSCA: CEPHALOPODA - CUTTLEFISH								
Spirula spirula		d	d		d			
ECHINODERMATA: ASTEROIDEA - SEASTARS								
Allostichaster polyplax	f							
Coscinasterias muricata							o	
Patiriella regularis	f	c			c		f	
Stichaster australis	f							
ECHINODERMATA: ECHINOIDEA - SEA EGGS								
Echinocardium cardatum				o	o			o
Evechinus chloroticus	f	o					o	
Fellaster zelandiae		d		c	f	r		
ECHINODERMATA: HOLOTHURIA - SEA CUCUMBERS								
Australocnus calcareus		o		r				
Stichopus mollis		c					f	
Taeniogyrus sp.						r		r
ECHINODERMATA: OPHIUROIDEA - BRITTLE STARS								
Ophionereis fasciata	r	f					o	
CRUSTACEA: REPTANTIA - CRABS								
Cancer novaezelandiae							d	
Cyclograpsus lavauxi		f					f	
Elamena producta	o							
Halicarcinus cooki						o		
Halicarcinus varius						f		
Halicarcinus sp.	o							
Helice crassa								c
Hemigrapsus edwardsi	r				d		o	
Leptograpsus variegatus	f						f	
Macropthalmus hirtipes								c
Notomithrax peronii						r		
Notomithrax ursus							r	
Ovalipes catharus			o		d	r		
Ozius truncatus	f	c					c	
Paguristes pilosus						o		
Pagurus novizelandiae	o	o					c	
Petrolisthes elongatus	f	f					f	
Pilumnus lumpinus		f						

	A	B	C	D	E	F	G	H
Plagusia chabrus	f	f					f	
hermits indet						c		
CRUSTACEA: DECAPODA - SHRIMPS								
Alope spinifrons	f	o						
Ogyrides delli				o				
CRUSTACEA: AMPHIPODA								
Gammaropsis typica						o		
Heterophoxus sp.				c				
Liljeborgia hansoni				r				
Melita awa						f		
Otagia neozelanica				r				
Paradexamine pacifica						c		
Paracentromedon hake				o				
Protophoxus australis						o		
Proharpinia sp.				o				
Torridoharpinia hurleyi						c		
Trichophoxus chelatus				f		r		
Trichophoxus spinibasus				r				
CRUSTACEA: ISOPODA								
Astacilla sp.				r				
Ligia novaezelandiae	o	c						
Macrochiridothea uncinata				o				
Natatolana sp.				r				
CRUSTACEA: CUMACEA								
Cyclaspis argus				r				
Cyclaspis triplicata				r				
Diastylopsis crassior				r				
CRUSTACEA: LEPTOSTRACA				r				
CRUSTACEA: OSTRACODA				o				
Diasterope grisea						o		
CRUSTACEA: PYCNOGONIDA						r		
CRUSTACEA: CIRRIPEDIA - BARNACLES								
Austrominius modestus		f					a	
Chamaesipho brunnea	a							
Chamaesipho columna	a							
Epopella plicata	r							
Notomegabalanus decorus	r					d	r	
Tetraclita purpurascens	f							
BRACHIOPODA - LAMP SHELLS								
Calloria inconspicua							r	
CNIDARIA - ANENOMES, HYDROIDS								
Actinia tenebrosa	o							
Actinothoe albocincta		f		r				
Amphisbetia bispinosa			d					
Cricophorus nutrix	o							
Culicia rubeola							f	
Diadumene neozelanica							o	
Edwardsia tricolor				r				
Isactinia olivacea		o						
Isocradactis magna	r						o	
Oulactis muscosa	o							
POLYCHAETA - WORMS								
Aglaophamus macroura				c		r		o
Amphicteis philippinarum				o				
Armandia maculata				r		c		
Asychis ?theodori						o		o
Axiothella quadrimaculata						f		
Boccardia sp.				r				r
Bradabyssa sp.				r				
Capitellidae						c		
Cirratulidae						r		
Cossura sp.						c		
Enoe iphionoides						r		
Eupholoe sp.						r		
Flabelliderma sp.		r						
Galeolaria hystrix	r							
Glycera lamellipodia				o		o		
Glycinde dorsalis				o		r		
Goniada littorea				f				
Hemipodus simplex						r		
Paraidanthyrsus pennatus		r				r		
Irmula sp.						r		

	A	B	C	D	E	F	G	H
Lepidastheniella sp.						f		
Lepidonotus polychromus		o				o		r
Lumbrineridae		r				r		
Lumbrineris aotearoae						r		
Lumbrineris coccinea						r		
Magelona papillicornis				o				
Marphysa depressa						o		
Megalomma sp.		r						
Nereidae		o				f		r
Onuphis aucklandensis				r				
Owenia fusiformis						r		
Paraprionospio sp.				r				
Pectinaria australis				o				r
Perinereis ambylodonta		o					r	
Pherusa parmata							c	r
Phyllodocidae				r		r		
Prionospio sp.				r		a		
Spirobranchus cariniferus	c				d		f	
Sabellaria kaiparaensis	o							
Salmacina australis	r	o						
Schistomeringos sp.						o		
Spirorbis sp.		f						
?*Sthenolepis* sp.				f				
Streblosma gracile						f		
Syllidae						r		
Terebellanice sp.						o		
Terebellidae		r						r
POGONOPHORA						o		
NEMERTEA - UNSEGMENTED WORMS				r		o		r
PLATYHELMINTHES - FLAT WORMS								
Stylochoplana sp.		o						
PORIFERA - SPONGES								
Aaptos confertus							c	
Ancorina alata	o							
Ciocalypta polymastia							f	
Corticellopsis novaezelandiae	o						r	
Halichondria moorei							c	
Microciona coccinea	r							
Polymastia granulosa							r	
Tethya aurantium	o						c	
Tethya australis	r						o	
ASCIDIA - SEA SQUIRTS								
Asterocarpa coerulea		r						
Cnemidocarpa bicornuta							a	
Corella eumyota		f					f	
Pyura sp.		o					a	
ALGAE - SEAWEEDS								
Aeodes nitidissima	o							
Apophloea sinclairii	o							
Carpophyllum maschalocarpum	a							
Codium fragile		r						
Corallina officinalis	a	c					c	
Cystophora torulosa	o							
Dictyota ?intermedia							r	
Gigartina alveata	a							
Gigartina marginifera	f							
Hormosira banksii	c	c					c	
?*Kallymenia* sp.							r	
Melanthalia abscissa	o							
Monostroma sp.							o	
Pachymenia lusoria	c							
Placentophora colensoi	o							
Pterocladia lucida	o							
Sargassum sinclairii							o	
Splachnidium rugosum							r	
Ulva lactuca	o							
Zonaria turneriana	o							
LICHENS: INTERTIDAL								
Lichina confinis	f	f						
VASCULAR PLANTS: INTERTIDAL								
Avicennia marina var. *australasica*								r
Zostera sp.		c						f

Fig. 2. Some of the more common or characteristic members of the faunas of the rocky shores of Raglan Harbour. Specimens drawn by Margaret Morley, Powell (1987) and Morton & Miller (1968).



ECOLOGICAL NOTES

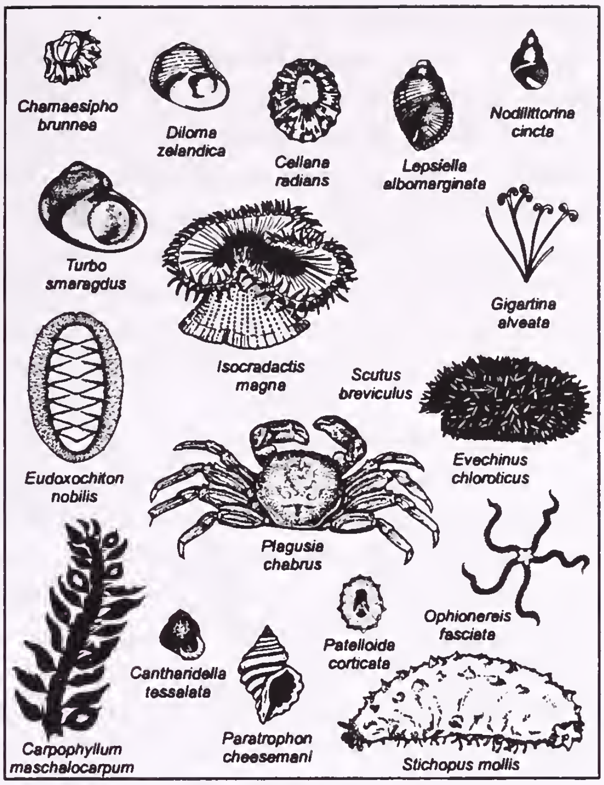
Sheltered harbour rocky shore (Fig. 2)

94 species (70 living) were recorded from the dominantly limestone rocky shore on the north side of Raglan Harbour. In places horizontal stretches of reef are draped in a thin veneer of mud, and further up the harbour deep drifts of mud have built up in depressions and hollows between the rocks. The dominant high and mid tidal zoning organisms are the acorn barnacle *Austrominius modestus* and the profuse Pacific oyster *Crassostrea gigas,* with sparse flea mussel *Xenostrobus pulex,* tube-worm *Spirobranchus cariniferus,* and Neptune's necklace *Hormosira banksii.* Common grazers and detritivores at these levels are *Nodilittorina antipodum, Diloma subrostrata, Sypharochiton pelliserpentis* and *Chiton glaucus.*

The diversity of the biota increases towards low tide levels, particularly towards spring low tide levels where the murky water usually cuts down light penetration and allows colourful sponges (e.g., *Aaptos confertus, Halichondria moorei, Polymastia granulosa, Tethya aurantium, T. australis*) and tunicates (e.g., *Cnemidocarpa bicornuta, Corella eumyota, Pyura*) to live in the open on the rocks, as well as in crevices and under the few boulders present. Also common around this level are a number of crabs, such as the hermits *Pagurus novizelandiae,* black-finger crab *Ozius truncatus,* half crab *Petrolisthes elongatus,* and larger *Leptograpsus variegatus* and *Plagusia chabrus.* The polychaete *Pherusa parmata* is frequently encountered here, together with less common *Perinereis novaehollandiae.* The low tidal chitons present are mostly *Acanthochitona zelandica* and *Cryptoconchus porosus*, with rare *Plaxiphora violacea.* Low tide herbivores include *Cookia sulcata, Evechinus chloroticus.* Carnivores include the gastropods *Dicathais orbita, Cymatium parthenopeum* and rare *Buccinulum linea* and *Calliostoma punctulatum*, and seastars *Coscinasterias muricata* and *Patiriella regularis.* Colourful nudibranchs on this shoreline are *Dendrodoris citrina* and *Doriopsis flabellifera,* together with the colonial coral *Culicia rubeola.* The anenomes *Diadumene neozelanica* and *Isocradactis magna* are occasionally present. Also of note are a few live specimens of the small red brachiopod *Calloria inconspicua* attached to low tide rocks. Cemented to low tide rocks in several places is the bivalve *Cleidothaerus albidus.*

A short stretch of softer sandstone reef at low tide level is bored by *Zelithophaga truncata* and the pholads *Pholadidea suteri* and rarer *Barnea similis,* their empty hollows sometimes occupied by *Irus reflexus.*

Fig. 3. Some of the more common or characteristic members of the rocky shore at Whale Bay, south of Raglan Harbour mouth. Specimens drawn by Margaret Morley, Powell (1987) and Morton & Miller (1968).



Exposed rocky shore (Fig. 3)

On the exposed, intertidal boulders and shore platform at Papanui Point, biodiversity is low (23 species recorded). This is partly because of the exposure to pounding surf, and partly because of scouring by the shifting sand. At mid and high tide levels the dominant zoning organisms are the barnacles *Chamaesipho columna* and *Epopella plicata,* the flea mussel *Xenostrobus pulex* and the sand tubeworm *Sabellaria kaiparaensis.* Less obvious are the grazing limpets, chitons and slugs *Cellana ornata, C. radians, Sypharochiton pelliserpentis* and *Onchidella nigricans*. Under the shaded edges of boulders are the dark red anenomes *Isactinia tenebrosa.* The most common carnivores on the upper shore are the oyster borers *Lepsiella albocolumella* and the purple crab *Leptograpsus variegatus.*

Lower on the shore the dominant alga is *Gigartina alveata* and *Corallina* turf, and the dominant zoning bivalve is the green-lipped mussel *Perna canaliculus*, with its associated predator seastar *Stichaster australis.* Also present around lower tide levels are the orange golf ball sponge *Tethya aurantium,* the encrusting crimson sponge *Microciona coccinea*, the large chiton *Plaxiphora obtecta,* the carnivorous thaid *Dicathais orbita* and the fierce red crab *Plagusia chabrus.*

Where the shore is more sheltered outside the lagoon around Whale Bay, there is a greater variety of microhabitats and consequently much greater diversity of plant (14 seaweeds) and animal (91 species) life, including the seaweed fauna (below). At high and mid tide levels on the bouldery and rocky shore the dominant zoning organisms are the barnacles *Chamaesipho brunnea* and *C. columna*, tube-worm *Spirobranchus cariniferus,* grazing herbivores *Nodilittorina antipodum*, *Cellana radians, Diloma zelandica, Siphonaria australis* and *Sypharochiton pelliserpentis*, and carnivorous oyster-borer *Lepsiella albomarginata.* Moving down towards low tide these are progressively replaced by the common zoning algae *Hormosira banksii, Gigartina alveata, Carpophyllum maschalocarpum* and *Corallina,* with associated grazing fauna of *Acanthochitona zelandica, Patelloida corticata* and less frequent *Eudoxochiton nobilis, Ischnochiton maorianus, Haliotis iris, Turbo smaragdus* and *Evechinus chloroticus.* Among the diverse carnivores and scavengers at lower tidal levels are seastars *Allostichaster polyplax, Stichaster australis* and *Patiriella regularis,* the crabs *Leptograpsus variegatus, Ozius truncatus* and *Plagusia chabrus,* and gastropods *Buccinulum vittatum* and *Dicathais orbita.*

Beneath and between the large stable boulders at low tide level is a profusion of colourful sponges, such as *Tethya aurantium, T. australis, Ancorina alata, Microciona coccinea.*

Seaweed molluscs

Many small gastropods live on low tidal brown and red algae, with a lower diversity found in the rocky habitats inside Raglan Harbour (6 species) than outside at Whale Bay (10 species), where there is also a greater diversity of seaweeds. Only two mollusc species were found at both localities - *Eatoniella olivacea* and *Eatonina atomaria.* On rocks on the north shore of the harbour the seaweed fauna is dominated by *E. atomaria, Eatoniella limbata, Amphithalmus semen* and *Orbitestella parva,* with fewer live *E. olivacea* and *Pisinna olivacea impressa.* At Whale Bay the seaweed fauna is dominated by *Cantharidella tesselata, Amphithalmus semen* and *Micrelenchus sanguineus,* with less common *Eatoniella atervisceralis, E. olivacea,* and *Zalipais lissa.* Also present on the seaweed in low numbers are *Eatoniella latebricola, Eatonina subflavescens, E. atomaria,* and *Pisinna zosterophila.*

Whale Bay intertidal lagoon

103 species (69 living) were found living in the Whale Bay intertidal lagoon, around its rocky margins or washed up on its small sheltered sandy beach. Large patches of *Zostera* live in and around the edges of the permanently ponded parts of the lagoon with wedge shells *Macomona liliana* living in the sediment amongst its roots. Clumps of the tall branching *Codium fragile,* and Neptune's necklace *Hormosira banksii* also grow in the lagoon, together with the large sea cucumber *Stichopus mollis,* cushion star *Patiriella regularis* and three scavenging species of whelk *Cominella adspersa, C. glandiformis* and *C. maculosa.* Numerous stable cobbles or small boulders are half submerged in the lagoon. Sheltering beneath them are often found the crab *Ozius truncatus,* the black slug *Scutus breviculus,* limpet *Tugali suteri,* tunicate *Corella eumyota,* brittlestar *Ophionereis fasciata* and polychaetes *Perinereis novaehollandiae* and *Lepidonotus polychromus.*

On low basalt cliffs at high tide level around the side of the lagoon grows a black stubble of *Lichina confinis*, the grazing limpets *Notoacmea pileopsis* and *Cellana radians,* and periwinkles *Nodilittorina antipodum.* Beneath stable cobbles in relative shelter at high tide level at the head of the lagoon live *Diloma bicanaliculata, Nerita atramentosa,* and the fast-running crustaceans *Ligia novaezelandiae* and *Cyclograpsus lavauxi.*

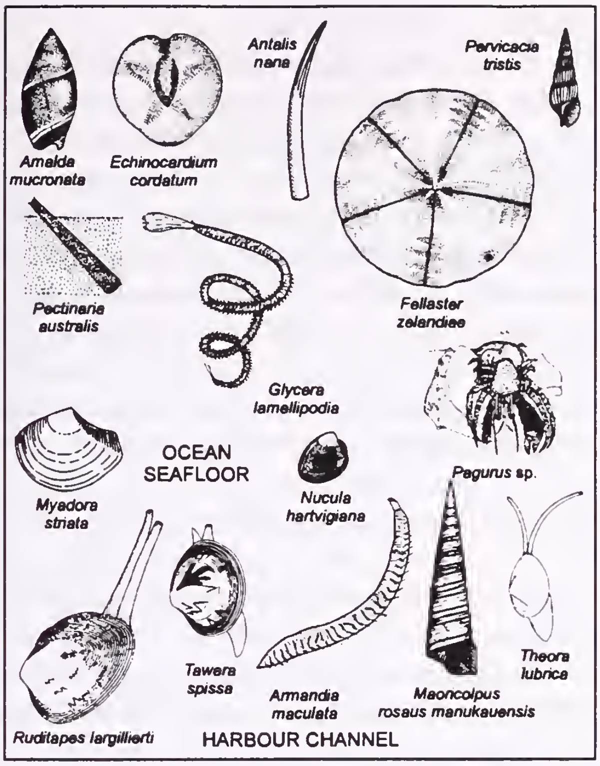
Exposed ocean beaches

Like exposed beaches elsewhere, sandy Ngarunui and Ruapuke Beaches, either side of Mt Karioi's rocky shore, support an extremely limited number of organisms. The only living organisms were low numbers of the swimming crab *Ovalipes catharus.* Numerous shells are washed up on these beaches reflecting the composition of the fauna around low tide mark and just offshore mostly in the shallow subtidal surf zone - these include abundant surf clams *Mactra murchisoni, Peronaea gaimardi, Resania lanceolata, Spisula aequilatera, Tellinota edgari* and the two tuatua species *Paphies donacina and P. subtriangulata.* Also washed up is a range of less common species washed in from slightly further offshore or washed out by tidal currents from Raglan Harbour (e.g., olive shell *Amalda mucronata,* bivalves *Dosinia zelandica, Gari lineolata, Gari stangeri, Maorimactra ordinaria, Pecten novaezelandiae, Scalpomactra scalpellum, Tawera spissa,* and cuttlefish shell *Spirula spirula*).

Harbour entrance beach

Twelve species were found living in the fine to medium sand of Wainamu Beach, on the south shore of Raglan Harbour entrance, and the remains (mostly shells) of another 84 species were found washed up. The two most common live organisms are the small gastropod *Zethalia zelandica* and the cushion star *Patiriella regularis,* both of which live on and in the surface sand at spring low tide level and below. Also found in fewer numbers in the same habitat are the sand dollar *Fellaster zelandiae* and heart urchin *Echinocardium cordatum,* olive shell *Amalda australis,* whelk *Cominella adspersa,* horse mussel *Atrina zelandica,* and the bivalves *Dosinia subrosea, Macomona liliana, Myadora striata, Mylitella vivens vivens* and *Theora lubrica.* Washed up on the beach are a wide variety of mollusca sourced from both inside and outside the harbour, including the wood borer *Bankia australis* in a driftwood log.

Fig. 4. *Characteristic members of the subtidal sediments of the channel in Raglan Harbour and also of the inner shelf seafloor offshore from the entrance to Raglan Harbour. Specimens drawn by Margaret Morley, Powell (1987) and Morton & Miller (1968).*



Subtidal harbour channel (Fig. 4)

121 species (68 living) were identified in the eight small dredge hauls taken in Raglan Harbour. The living fauna includes 29 species of polychaete worms, 13 bivalves, 6 amphipods, 4 gastropods and 4 crabs. No live organisms were recovered from the mobile clean sand bottom in the deepest (16 m) and most strongly current-swept part of the entrance channel. Opposite Raglan township the channel sediment is sandy shell gravel and it becomes progressively finer moving up the harbour to where it is fine sandy mud 6km up off Motukokako Point. Channel sediment is usually dominated by the large turret shell *Maoricolpus roseus manukauensis* (up to 1000 per sq. m) together with the nutshell *Nucula hartvigiana.* In the coarser sediment are the more robust bivalves *Ruditapes largillierti, Dosina zelandica, Gari stangeri* and *Tawera spissa,* together with numerous hermit crabs and the slipper limpet *Zegalerus tenuis.* The polychaete *Armandia maculata* is common in the coarse sediment, whereas in fine sediment the dominant polychaetes are capitellids, *Cossura* and *Prionospio.*

The most diverse faunas were recovered from two dredge stations taken in sand and shell gravel just below spring low tide level on the edge of the channel. These also have abundant live turret and nut shells, together with smaller or thinner-shelled bivalves such as *Arthritica bifurca, Divaricella huttoniana, Felaniella zelandica, Leptomya retiaria, Pseudoarcopagia disculus* and *Theora lubrica.* Also common are the pillbox crabs *Halicarcinus,* hermit crabs, amphipods *Paradexamine pacifica* and *Torridoharpinia hurleyi*, and numerous polychaetes, particularly *Prionospio, Armandia maculata, Lepidastheniella, Axiothella quadrimaculata, Lepidonotus polychromus, Streblosoma gracile,* capitellids and nereids.

Of interest was the presence of a living specimen of the small scaphopod *Antalis nana* in less than 1 m of water at low tide.

Offshore seafloor (Fig. 4)

72 species (46 living) were identified from the six small dredge hauls taken from the clean sand seafloor offshore from the entrance to Raglan Harbour. The live fauna includes 15 species of polychaete worms, 7 amphipods, 5 bivalves, 4 gastropods, 3 isopods and 3 cumaceans. Inshore (shallower than 10 m) in slightly coarser sediment (medium sand), faunal diversity is low and dominated by amphipods, isopods and a few bivalves and polychaetes. The most common amphipods are *Trichophoxus chelatus* and *T. spinibasus,* and the most common isopod is *Macrochiridothea*

uncinata. *Sthenolepis* and *Magellona papillicornis* are the most frequent polychaetes, and the live bivalves are the nut shell *Nucula nitidula* and the tuatua *Paphies donacina.*

In the clean fine sand further offshore (11-20 m depth), the fauna becomes increasingly more diverse and abundant with increasing depth and presumably stability. It is dominated by diverse polychaetes, with subdominant bivalves, amphipods, cumaceans and gastropods. The most common polychaetes are *Aglaophamus macroura, Sthenolepis, Pectinaria australis, Goniada littorea, Glycera lamellipodia, Amphictis philippinarum* and *Glycinde dorsalis.* Live molluscs in order of decreasing abundance are *Myadora striata, Amalda mucronata, Nucula nitidula, Pervicacia tristis, Myadora antipodum, Chemnitzia, Dosinia subrosea, Pupa kirki* and *Antalis nana.* Common amphipods are *Heterophoxis, Proharpinia, Paracentromedon hake* and *Liljeborgia hansoni.* Also present are live sand dollars *Fellaster zelandiae* and heart urchins *Echinocardium cordatum* and common at 20 m is the small decapod *Ogyrides delli.*

Sheltered harbour beaches

Thirty species were found living on or in the sand or mud substrate of the sheltered beaches around the foreshore of Raglan Harbour. Most common at high tide level are the mud snail *Amphibola crenata* and the mud crab *Helice crassa.* At mid to low tide level the most common organisms are the cockle *Austrovenus stutchburyi,* wedge shell *Macomona liliana,* and pipi *Paphies australis,* the horn shell *Zeacumantus lutulentus* and lower tidal mud crab *Macrophthalmus hirtipes.* At low tide level and below are numerous nutshells *Nucula hartvigiana* and patches of the small introduced semeliid bivalve *Theora lubrica.* Mid to low tidal carnivorous gastropods include *Xymene plebeius, Cominella glandiformis* and *C. quoyana.* Eight worm taxa were found burrowing in the soft substrate at lower tidal levels, particularly *Aglaophamus macroura* and maldanids. Also present is the worm-like holothurian *Trochodota* and unidentified nemertine worms. Small patches of *Zostera* are present intertidally on the north shore.

MOLLUSCAN BIOGEOGRAPHIC NOTES

The mollusc species listed below and found in this Raglan study, provide the first published records of 15 taxa from New Zealand's west coast. The Raglan records of a further 4 mollusc species, extend their published range southwards down the west coast and a further 5 species extend their published northernmost range on the west coast of the North Island. Powell's and subsequent published ranges have been used when commenting on range extensions, because Spencer & Willan (1996) give zoogeographic provinces only. These provinces (Powell 1955) are used here to summarise the known range of each species (A = Aupourian, C =Cookian, F = Forsterian, M = Moriorian, An = Antipodean). Additional unpublished records from the collections of the Auckland Museum (AK), and Margaret Morley (MM), are cited where they additionally extend the published range of species found at Raglan.

<u>First West Coast records</u>

* *Brookula (Aequispirella) finlayi* Powell, 1965, Trochidae

Previously recorded from the Three Kings and Mokohinau Islands down the east coast to the Chatham Islands (Powell 1979). This Raglan specimen (AK140276) is the first record from the west coast of the North Island. The range is further extended by specimens from Cape Maria van Diemen, Northland, Whanganui Bight (24 m), and Kaikoura (all MM). The range for *Brookula finlayi* is now A, C, and M provinces.

* *Buccinulum pertinax pertinax* (Martens, 1878), Buccinidae

Previously recorded from the southern half of the South Island, Stewart and Chatham Islands and the Subantarctic. This Raglan specimen (AK140146) found at Whale Bay is the first record from the North Island. Its range is updated to C, F, M and An provinces.

**Eatoniella globosa* Ponder, 1965, Eatoniellidae
Previously recorded from off north-east Northland, this specimen from Raglan Harbour (AK140273) is the first west coast record. We have additional records from New Plymouth (AK, Hayward and Morley in press). The range for *Eatoniella globosa* is now A and C provinces, including the west coast of the North Island.

**Eatoniella notata* Ponder & Yoo, 1977, Eatoniellidae
Previously recorded on algae in exposed situations off the east coast of the the northern North Island. These Raglan specimens (AK140282) are the first west coast records. We have an additional record from Mercer Bay, Waitakere coast (AK). The range for this species is now A and C provinces, including the west coast of the North Island.

**Eatoniella roseospira* (Powell, 1937), Eatoniellidae
Previously recorded from the Three Kings and down the north-east coast of Northland (Powell 1979). This Whale Bay specimen (AK140261) is the first record from the west coast and extends this species range to A and C provinces, including the west coast of the North Island.

**Eatonina (Otatara) subflavescens* (Iredale, 1915), Cingulopsidae
Previously recorded from the north east of the North Island and the Bounty Islands. This Whale Bay specimen (AK140249) is the first west coast record. We know of other unpublished west coast records from Cornwallis, Manukau Harbour (AK), and Ahipara (AK, Hayward et al, in prep). The range for this species is now A, C and An provinces, including the North Island west coast.

**Incisura lytteltonensis* (E.A. Smith, 1894), Scissurellidae
Previously recorded from all provinces, but this specimen (AK1402690) from algae in Raglan Harbour is the first from the west coast. We have an additional record from Destruction Gully, Waitakere coast (AK, Hayward and Morley in prep.).

**Odostomia vestalis* Murdoch, 1905, Pyramidellidae
Previously only recorded from Whangaroa Harbour, north-east Northland, these Raglan Harbour specimens (AK140271) from Wainamu Beach provide a significant range extension. The range is now A and C provinces, including the west coast of the North Island.

* *Ophicardelus costellaris* (H. & A. Adams, 1854), Ellobiidae
Previously recorded in high tidal situations from the North Island and northern parts of the South Island. This record from Raglan Harbour and another from Herekino Harbour (MM) are the first definite west coast records. This species is known from A and C provinces and now includes the west coast of the North Island.

* *Pisinna olivacea impressa* (Hutton, 1885), Anabathronidae
Previously recorded from Cape Maria van Diemen, Northland, down the east coast to Banks Peninsula and the Chatham Islands. This Raglan specimen (AK140289), found alive under rocks, is the first west coast record. We have an additional record from Chalky Inlet, Fiordland in anchor mud at a depth of 25m (MM). The range is now updated to A, C, F and M provinces including the west coast of the North and South Islands.

* *Pusillina (Haurakia) latiambia* (Ponder, 1967), Rissoidae
Previously recorded from the east of the northern North Island, from Tom Bowling Bay to Mount Maunganui (AK). This specimen from the north side of Raglan Harbour (AK140280) is the first west coast record. It is now known from A and C provinces, including the west coast of the North Island.

* *Acar sociella* (Brookes, 1926), Arcidae
Previously recorded from the east coast of Northland, and from Wellington Harbour (Marshall 1998). This specimen from Raglan Harbour (AK140299) is the first west coast record, but we have additional west coast records from Herekino, Northland, and Dusky Sound, Fiordland (MM). The range is further extended wit hrecords from Foveaux Strait (in 33m) and the Chatham Islands(all MM). The range for *Acar sociella* is now extended to include A, C, F and M provinces.

* *Gaimardia (Neogaimardia) finlayi* (Powell, 1933), Gaimardiidae
Previously recorded from shell sand at Tom Bowling Bay, North Cape and Parengarenga Harbour.

The Raglan specimens (AK139033) were attached to the narrow fronds of the red alga *Osmundaria colensoi* at Whale Bay. We know of additional west coast records from the coast of the Waitakere Ranges (Hayward and Morley in prep.) and Kiritehere, south of Kawhia (MM). *Gaimardia finlayi* is now known from A and C provinces.

* *Soletellina nitida* (Gray in Dieffenbacher, 1843), Psammobiidae

Previously recorded from North, South, Stewart and Chatham Islands as common in shallow water off sandy beaches. This Raglan specimen (AK) together with several recent finds on beaches of the Waitakere Ranges (Hayward and Morley in prep.) are the first records from the west coast of the North Island. This species is already known from A, C, F, M and An provinces and now includes the west coast of the North Island.

<u>Southward extension of range on the west coast</u>

* *Buccinulum robustum* Powell, 1929, Buccinidae

Previously recorded from the eastern side of northern New Zealand, from the Three Kings Islands to East Cape, and from Kawerua on the west coast of Northland. This Raglan record is the southernmost record of the species on either coast of the North Island. The range for this species is updated to A and C provinces, including the west coast of the North Island.

**Merelina lyalliana* (Suter, 1898), Rissoidae

Previously recorded from the length of the east coast of the North Island including Lyall Bay, Wellington's south coast. This Raglan specimen (AK140256) extends its range southwards down the west coast, having been recorded previously from Kawerua, Northland (Hayward et al. 1995). We have additional records from South Bay, Kaikoura; Akaroa; Luncheon Cove, Dusky Sound (3m), and Puysegur Point, Fiordland (MM, AK). The range of *M. lyalliana* is now extended to A, C and F provinces, including the west coast of the North Island.

**Odostomia takapunaensis* Suter, 1908, Pyramidellidae

Previously recorded from the inner Hauraki Gulf and from Kawerua on the west coast of Northland (Hayward et al. 1995). The specimen (AK141878) dredged in 11 m off Whale Bay, Raglan, is the southernmost record of this species on either side of the North Island. Its range is now known to be A and C provinces, including the west coast of the North Island.

* *Zalipais lissa* (Suter, 1908), Skeneidae

Previously recorded from eastern New Zealand from Tom Bowling Bay to Otago and the Chatham Islands, and south down the west coast fo the North Island to the Manukau Harbour. This specimen, from algae at Whale Bay, Raglan (AK140246) and another recently collected from New Plymouth (Hayward and Morley in press) are now the southernmost records on the west coast. *Zalipais lissa,* already known from A, C, F, M and An provinces is now recorded from the west coast of the North Island.

<u>Northward extension of range on the west coast</u>

* *Eulima perspicua* (Oliver, 1915), Pyramidellidae

Previously recorded from the east coast of northern New Zealand (Powell 1979) and from New Plymouth (Hayward et al. 1999). This Raglan record extends its range northwards on the west coast.

**Pupa kirki* (Hutton, 1873), Acteonidae

Previously recorded from the east coast of the North Island, south to Cook Strait (Powell 1979) and from off Urenui, north Taranaki (Hayward et al. 1999). These specimens dredged off the mouth of the Raglan Harbour extend its range northwards on the west coast.

* *Zemitrella pseudomarginata* (Suter, 1908), Columbellidae

Previously recorded from north-eastern North Island (Spencer & Willan 1996) and from the west coast at Kawhia (Morley et al. 1997). This specimen (AK140297), dredged in the Raglan Harbour channel, extends the species range northwards on the west coast.

* *Cardita aoteana* Finlay, 1926, Carditidae
Previously recorded from around all of New Zealand, but this Raglan record is the first from the west coast north of New Plymouth (Hayward et al. 1999).
* *Myadora antipodum* E.A. Smith, 1880, Myochamidae
Previously recorded from around all of New Zealand, but this Raglan specimen is the first from the west coast north of Urenui (Hayward et al. 1999).

DISCUSSION

In general the exposed rocky shores along the west coast of the northern half of the North Island, from New Plymouth to Ninety Mile Beach, have a relatively low diversity fauna similar to that recorded here from Papanui Point. The softer sandstone rocky substrates of north Taranaki have the lowest diversity of all (Hayward et al. 1999), whereas the harder volcanic, greywacke or limestone substrates provide a greater topographic diversity of microhabitats and more stable surfaces which allows colonisation by a greater diversity of organisms, like barnacles and limpets.

Four west coast localities have considerably greater diversity of intertidal rocky shore biota. These are New Plymouth swimming pool reef (Hayward et al. 1999), Whale Bay coast, Kawerua (Hayward et al. 1995), and Ahipara to Reef Point (pers. obs.). The Kawerua coast has large basalt flow reefs that extend a long way out into the surf and provide unusual shelter and diversity of habitats in the shallows on their landward side. The other three localities face north and are more sheltered than the rest of the coast from the dominant south-west to west swells. Similar increased diversity also occurs on rocky shores just inside the entrance to some of the west coast harbours, such as at Te Maika, Kawhia Harbour entrance (Morley et al. 1997), Paratutae to Cornwallis, Manukau Harbour entrance (pers. obs.), Herekino Harbour entrance (pers.obs.) and here on the north side of Raglan Harbour entrance.

The subtidal biota of the strong current-swept Raglan Harbour channel with its common turret shells, *Maoricolpus*, and thick-shelled bivalves such as *Ruditapes* and *Tawera,* is similar to the harbour channel fauna from the Manukau and Waitemata Harbours (Powell 1937, Hayward et al. 1997), but differs from the nearby Kawhia Harbour, which appears to lack the larger molluscs (Morley et al. 1997).

The subtidal biota living in fine sand beyond the surf zone (10-20m depth) off the exposed west coast of the northern half of the North Island has seldom been documented, except by beach wash-up material after storms. The only previous study we know of was our dredge survey off Urenui Beach, north Taranaki (Hayward et al. 1999) in similar conditions, slightly sheltered by a protruding point on the coastline. The fauna from both surveys is remarkably similar, although lower diversity was recorded here, probably because of fewer dredge samples. In both places the fauna is numerically dominated by amphipods, polychaetes, cumaceans and the decapod *Ogyrides delli.* All 14 polychaetes and most of the amphipods and cumaceans recorded off Raglan were also present, in approximately the same order of abundance, as off Urenui (Hayward et al. 1999). The total (live plus dead) molluscan faunas are similar between Raglan and Urenui, but the live records differ considerably with *Amalda mucronata* and *Myadora* 2 spp. common alive off Raglan, but only recorded dead off Urenui. Conversely *Maorimactra ordinaria, Scalpomactra scalpellum, Austrofusus glans, Neoguraleus amoenus* and *Tanea zelandica* are among the more common live molluscs recorded off Urenui, but none of these were found live off Raglan. These differences between the live mollusca from bot hareas probably reflects patchiness and no real ecological difference.

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Appendix I: Study and sample sites along the coast of north Taranaki.

L numbers are the station localities recorded in Auckland War Memorial Museum Marine Catalogue.

Intertidal survey sites

Whale Bay	37°50'S	174°48'E	L25500-3
Wainamu Beach	37°48'S	174°50'E	L25504
Raglan Hbr south shore	37°48'S	174°52'E	L25505,19, 26
Raglan Hbr north shore	37°48'S	174°51'E	L25506-9
Papanui Point 37°53'S	174°46'E	L25525	

Subtidal dredge stations

Outside Raglan Harbour

L25510	37°48.8'S	174°48.5'E	11 m	clean fine sand
L25511	37°48.3'S	174°47.9'E	14 m	clean fine sand
L25512	37°48.0'S	174°47.1'E	20 m	clean fine sand
L25513	37°48.9'S	174°49.3'E	5 m	clean medium sand
L25514	37°49.1'S	174°49.4'E	4 m	clean fine-medium sand
L25515	37°49.2'S	174°48.8'E	6 m	clean medium sand

Inside Raglan Harbour

L25516	37°47.6'S	174°51.9'E	9 m	fine sandy shell gravel
L25517	37°47.7'S	174°51.8'E	11 m	shelly medium sand
L25518	37°48.0'S	174°51.9'E	2 m	shelly medium sand
L25520	37°48.0'S	174°51.6'E	16 m	clean medium sand
L25521	37°47.4'S	174°53.0'E	0.5 m	shelly muddy fine sand
L25522	37°47.8'S	174°53.6'E	5 m	shelly fine sand
L25523	37°47.2'S	174°54.1'E	5.5 m	fine sandy mud
L25524	37°47.9'S	174°53.0'E	0 m	muddy shelly rocky sand

Appendix II. Census data for 10 litre dredge samples taken offshore from Raglan Harbour mouth

Dredge penetration averaged 0.1 m into the sea floor sediment. Live organisms are in numbers of individuals; presence of dead shells is indicated by d. Organisms found only dead are not listed.

	Offshore dredging									Harbour dredging				
L25..	510	511	512	513	514	515	516	517	518	520	521	522	523	524
POLYPLACOPHORA														
Ischnochiton maorianus	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Leptochiton inquinatus	.	.	.	.	.	.	.	.	.	.	1	.	.	.
GASTROPODS	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Amalda australis	d	d	.	.	d	.	.	d	.	.	1	.	.	.
Amalda mucronata	3	1	2	.	.	.	.	.	.	.	.	.	.	.
Chemnitzea spp.	.	1	.	.	.	.	d	.	.	.	.	d	.	.
Maoricolpus roseus manukauensis	.	.	.	.	.	.	48	d	.	d	750	d	200	50
Pervicacia tristis	d	1	5	.	.	.	.	d	d	.	.	.	.	.
Pupa kirki	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Turbo smaragdus	.	.	.	.	.	.	.	.	d	.	.	.	.	5
Zegalerus tenuis	d	d	.	.	d	d	6	d	d	d	3	d	d	d
BIVALVES														
Arthritica bifurca	.	.	.	.	.	.	d	.	.	.	4	.	.	.
Corbula zelandica	.	.	.	.	.	.	d	d	d	.	1	1	.	.
Divarilucina huttoniana	.	d	.	.	d	.	.	.	.	.	1	.	.	.
Dosina zelandica	.	.	.	.	.	.	2	.	.	.	.	.	1	2
Dosinia subrosea	.	1	.	.	.	d	.	d	d	d	.	d	.	.
Felaniella zelandica	.	.	.	.	.	.	.	.	d	.	1	.	.	.
Gari stangeri	.	.	.	.	.	.	d	13	d	.	.	.	d	.
Leptomya retiaria	.	d	.	.	.	.	d	.	d	.	4	d	d	2
Macomona liliana	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Myadora antipodum	2	d	1	.	.	.	.	.	d	.	.	.	.	.
Myadora striata	5	2	2	.	.	.	.	.	d	.	.	d	.	.
Nucula hartvigiana	.	.	.	.	.	.	65	d	d	.	4	1	38	29
Nucula nitidula	.	d	8	3	.	d	.	.	.	.	.	.	.	.
Paphies donacina	.	.	.	1	d	.	.	.	.	.	.	.	.	.
Pseudoarcopagia disculus	.	.	.	.	.	.	.	1	.	.	4	.	.	2
Ruditapes largillierti	.	.	.	d	.	d	9	1	d	.	d	d	d	5
Tawera spissa	.	.	.	.	d	.	d	4	d	.	d	d	.	.
Theora lubrica	.	.	.	.	.	.	.	.	.	.	8	.	.	.
SCAPHOPODA														
Dentalium nanum	.	.	1	.	.	.	.	.	.	.	1	.	.	.
ECHINODERMS														
Echinocardium caudatum	d	.	2	.	.	d	.	.	.	.	.	.	.	.
Fellaster zelandiae	3	1	.	.	.	1	d	d	.	.	1	.	.	.
Ocnus calcarea	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Trochodota sp.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
CRABS														
Halicarcinus cooki	.	.	.	.	.	.	.	.	.	.	.	.	.	7
Halicarcinus varius	.	.	.	.	.	.	1	.	.	.	16	.	.	.
Ovalipes catharus	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Paguristes pilosus	.	.	.	.	.	.	.	.	.	.	4	.	.	.
hermits indet	.	.	.	.	.	.	50	2	.	.	25	.	.	25
SHRIMPS														
Ogyrides delli	.	.	7	.	.	.	.	.	.	.	.	.	.	.
AMPHIPODA														
Gammaropsis typica	.	.	.	.	.	.	.	.	.	.	4	.	.	.
Heterophoxus sp.	.	3	12	.	.	.	.	.	.	.	.	.	.	.

L25..	Offshore dredging 510	511	512	513	514	515	516	517	518	Harbour dredging 520	521	522	523	524
Liljeborgia hansoni	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Melita awa	.	.	.	.	.	.	.	.	.	.	4	.	4	.
Otagia neozelanica	.	.	.	.	2	.	.	.	.	.	.	.	.	.
Paradexamine pacifica	.	.	.	.	.	.	2	.	.	.	56	.	2	4
Paracentromedon hake	.	.	3	.	.	.	.	.	.	.	.	.	.	.
Protophoxus australis	.	.	.	.	.	.	.	3	.	.	.	.	.	.
Proharpinia sp.	.	5	.	.	.	.	.	.	.	.	.	.	.	.
Torridoharpinia hurleyi	.	.	.	.	.	.	3	.	.	.	52	.	4	5
Trichophoxus chelatus	.	.	.	1	13	1	1	.	.	.	.	.	.	.
Trichophoxus spinibasus	.	.	.	.	2	.	.	.	.	.	.	.	.	.
ISOPODA														
Astacilla sp.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Ligia novaezelandiae	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Macrochiridothea uncinata	.	.	.	.	2	5	.	.	.	.	.	.	.	.
Natatolana sp.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
CUMACEA														
Cyclaspis argus	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Cyclaspis triplicata	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Diastylopsis crassior	.	.	2	.	.	.	.	.	.	.	.	.	.	.
LEPTOSTRACA	.	.	1	.	.	.	.	.	.	.	.	.	.	.
OSTRACODA	.	.	3	.	.	.	.	.	.	.	.	.	.	.
Diasterope grisea	.	.	.	.	.	.	.	.	.	.	4	.	.	.
PYCNOGONIDA	.	.	.	.	.	.	1	.	.	.	.	.	.	.
COELENTERATA														
Actinothoe albocincta	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Edwardsia tricolor	.	.	1	.	.	.	.	.	.	.	.	.	.	.
POLYCHAETA														
Aedicera sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Aglaophamus macroura	2	1	3	1	.	.	.	.	.	.	1	.	.	.
Amphicteis philippinarum	.	.	6	.	.	.	.	.	.	.	.	.	.	.
Armandia maculata	.	.	1	.	.	.	.	35	.	.	13	.	4	18
Asychis ?theodori	.	.	.	.	.	.	.	.	.	.	4	.	.	.
Axiothella quadrimaculata	.	.	.	.	.	.	.	1	.	.	8	.	.	.
Bradabyssa sp.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Capitellidae	.	.	.	.	.	.	.	1	.	.	22	.	13	14
Cirratulidae	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Cossura sp.	.	.	.	.	.	.	.	.	.	.	.	.	21	4
Enoe iphionoides	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Eupholoe sp.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
Glycera lamellipodia	.	2	2	.	.	.	.	.	1	.	1	.	.	3
Glycinde dorsalis	.	1	3	.	.	.	.	1	.	.	.	.	.	.
Goniada littorea	.	1	4	2	.	.	.	.	.	.	.	.	.	.
Hemipodus simplex	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Idanthyrsus pennatus	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Irmula sp.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Lepidasthenella sp.	.	.	.	.	.	.	.	.	.	.	5	.	.	16
Lepidonotus polychromus	.	.	.	.	.	.	.	.	.	.	1	.	.	3
Lumbrineridae	.	.	.	.	.	.	.	.	.	.	2	.	.	.
Lumbrineris aotearoae	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Lumbrineris coccinea	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Magelona papillicornis	.	.	.	.	.	3	.	.	.	.	.	.	.	.
Marphysa depressa	.	.	.	.	.	.	.	.	.	.	1	.	.	2
Nereidae	.	.	.	.	.	.	.	.	.	.	4	.	2	3
Onuphis aucklandensis	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Owenia fusiformis	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Paraprionospio sp.	.	.	.	2	.	.	.	.	.	.	.	.	.	.
Pectinaria australis	.	1	5	.	.	.	.	.	.	.	.	.	.	.
Phyllodocidae	.	.	1	.	.	.	.	.	.	.	1	.	.	.
Prionospio sp.	1	.	.	.	.	.	1	1	.	.	43	.	46	33
Schistomeringos sp.	.	.	.	.	.	.	.	.	.	.	2	.	.	1
?Sthenolepis sp.	2	3	2	.	1	2	.	.	.	.	.	.	.	.
Streblosma gracile	.	.	.	.	.	.	.	.	.	.	14	.	.	5
Syllidae	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Terebellanice sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
POGONOPHORA	.	.	.	.	.	.	.	.	.	.	3	.	.	3
NEMERTEA	.	.	1	.	1	.	.	.	.	.	.	.	1	5

Albino *Tanea zelandica* (Gastropoda: Naticidae) from Aromoana Beach, Dunedin.

Michael K. Eagle

Aramoana is a sleepy little settlement some 25 km from Dunedin, nestled into the southern lee of high volcanic cliffs to the north and isolated by the Dunedin Harbour entrance and Taiaroa Head to the south. A deep, relatively narrow channel situated between Aramoana Sand Spit and the southern peninsula, (where the Portobello Marine Laboratory of Otago University is located), is constantly dredged by the Otago Harbour Board. Outside the Harbour entrance, well offshore, lie submarine canyons, new deep-water molluscan fauna, and the supposedly cooler waters of the Forsterian Province of Powell (1979).

Aramoana possesses a substantial breakwater and three beaches. The breakwater is geographically called "the Mole" and is built atop the hulks of four sunken ships. Parts of the ships (at depth) protrude out into a small bay (designated a marine reserve) seaward of Aramoana Beach and are regularly dived upon by amateur enthusiasts. The first beach, (Spit Beach), is a classic dune system, complete with northern volcanic outcrops, a small "hole in the rock" exists at the tidal interface; all are exposed to the open Pacific Ocean facing directly east. Behind the shoreline lies a Department of Conservation Ecological Reserve. This beach is flanked to the south by "the Mole", which shelters Aramoana Beach proper, part of the "sand spit", a long-shore drift accretionary sliver terminating short of the main channel just inside the Otago Harbour entrance. Aromoana Beach is not in equilibrium; it is presently undergoing an offshore sand recruitment phase, eroding large sections of sand dune and causing some consternation to the owners of the four dwellings located distally there. The third beach opposes Aramoana Beach, is also part of the sand spit, being located just inside the Otago Harbour Entrance. It too is a Department of Conservation Ecological Reserve and consists of a partially grassed shoreline bordering expansive sand-flats. All beaches and dunes are of white, silica sand built supposedly out of the volcanic debris of the extinct, 10 million years old Dunedin Volcano, the center of which is located at Port Chalmers.

An evening walk along Aramoana Beach on August 20 2001, after a week of stormy weather, resulted in a bizarre find. Amongst a thick accumulation of storm-drift debris (seaweed, shells, sponges) stranded at the high-tide line on the sand-spit, opposite the main shipping channel, was a complete (animal and shell) all-white gastropod of the superfamily Naticacea, family Naticidae. Members of this family are found living in seas from the intertidal zone to hadal depths, are commonly called 'Moon Snails', and are one of the few exceptions to the rule that gastropods with rounded apertures are herbivorous. The turbinate to globose, solid, smooth, polished porcellanous appearance of the Naticidae, often have bold colour patterns in shades of orange, brown, or grey. However, the shell found at Aromoana had no such registration, being pure white. Initial identification thoughts turned to the genus *Polinices*, but although the colour was similar, overall shape, umbilical cavity, aperture and operculum were very different. Preservation

of the specimen in ethanol alcohol was undertaken for transport north and further attempts at identification.

The calcareous operculum of the specimen is smooth except for two weak marginal grooves, is tight-fitting within an entire aperture, without either canal or sinus and the inner-lip parietal callus is reflected across the umbilicus, joining a spiral funicle from within, resulting in a crescent groove. This description is diagnostic of the genus *Tanea*. Bruce Marshall (*pers comm.*, - Museum of New Zealand) confirms that the specimen belongs to that genus and constitutes an albino form of *Tanea zelandica* (Quoy & Gaimard, 1832) - commonly cast ashore live on ocean beaches. The albino form is known to rarely occur (probably in shallow water) about the Dunedin Harbour Heads, and is probably a genetic mutant. Further research to see whether the specimen has a central radula with one large elongated cusp instead of a tricuspid central tooth (as most natacoids do), and paired marginals that are long, narrow, curved, and simple pointed, will help confirm allocation to *Tanea zelandica.*

Tanea zelandica is usually "yellowish-fawn with five narrow whitish spiral bands, regularly patterned with crecentric to cheveron-shaped chestnut markings" (Powell 1979, p.154). *Tanea zelandica* is a carnivore predator that uses radula to drill a beveled, round hole into a a wide variety of molluscs (both bivalves and gastropods) after which the proboscis is inserted to facilitate feeding. *Tanea* 'plows' about infaunally (just beneath the surface of the sea floor) hunting prey, which when located, is enveloped in a large 'foot', and the rasping file of the radula is applied with a circular motion to a convenient part of the shell. Powell (1979; p.154) assumed that the drilling process was supplemented by the action of free acid that the animal was presumed to secrete from special glands, but research has revealed no such acid, and evidence found for the purely mechanical action of the radula only.

Not only is the feeding habit of *Tanea zelandica* specialized, but the egg capsules produced are also. When ready to spawn, the female deposits the eggs in a collar-shaped structure ('ring-shaped nidus' of Powell 1979) made of sand grains cemented together with mucus that is moulded into the peculiar shape over the margin of the aperture. The inside is lined with thousands of small eggs. *Tanea zelandica* is found Late Pliocene to Recent and is particularly "abundant fossil in all shallow-water, soft bottomed facies of Nukumaruan and Castlecliffian age (Beu *et al.* 1990).

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LAND & FRESHWATER SNAILS FROM GREAT BARRIER ISLAND, LITTLE BARRIER ISLAND, RAKITU ISLAND (ARID ISLAND), KAIKOURA ISLAND (SELWYN ISLAND), THE BROKEN ISLANDS (PIG ISLANDS) AND THE AIGUILLES ISLANDS (THE NEEDLES), NEW ZEALAND

Part 1

B.F. Hazelwood David J. Roscoe Frank Boulton

The Eight Provinces of the Barrier Islands, New Zealand.

1) Aiguilles Islands (The Needles or The Needle Rocks)
2) Northern Zone, Great Barrier Island.
3) Central Zone, Great Barrier Island.
4) Southern Zone, Great Barrier Island.
5) Rakitu Island (Arid Island)
6) Kaikoura Island (Selwyn Island) and its off-shore islands.
7) Little Barrier Island
8) Broken Islands (Pig Islands) - north of Whangaparapara

Part 1 comprises all previous work and Museum lists
Part 2 will cover recent collecting on Great Barrier Island (B.F. Hazelwood)

The Species List
The Great Barrier list has been compiled from two reports by Jim Goulstone -Poirieria, Vol.16, 1991. - Central Zone and part Northern Zone
Some introduced slug records are supplied by B.F.H.
Additional snail records were supplied by the Auckland Museum
Recorded data will be presented in **Part 2**

Two additional records collected from Oruawharoa, (between Tryphena and Medlands Beach) Great Barrier Island. (Collected Mrs. G. Mitchener) (from leaf mould) Poirieria Vol.3, Part.6, 1966. (21 species in sample) - Southern Zone (recorded N. Gardner)

Milligan [1](Tane Vol.7,1955 - 56)
Mentions collecting 25 species from a valley under Mt. Hobson (on the Fitzroy Harbour side). Few are revealed. - Mid Zone

Milligans List of Species
Therasia decidua
Phenacohelix ponsonbyi
Suteria ide
Murdochia cytora — *Cytora cytora*
Fectola roseveari — *Cavellia roseveari*
Laoma pirongiaensis
Tornatellinops novoseelandica
Schizoglossa novoseelandica barrierensis
The record of *Phenacohelix ponsonbyi* is erroneous. *P. giveni* is also present on Great Barrier Island, this was named by Cumber in 1961; after Milligans Report

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1 Ted Milligan died in 1999. He worked as a geologist, discovering many new, commercially viable coal deposits in Australia and adjacent territories. It is not known whether his snail collection still exists. This collection is of valuable reference significance, originating from some of New Zealands off-shore Islands.

Goulstone described the Gt.Barrier *P. ponsonbyi* as a new species,
Phenacohelix hakarimata Goulstone, 2001 This species ranges through the North Island - south of Auckland. From the Barrier Islands, to the Coromandel Peninsula, the Waikato down to Kai Iwi near Wanganui.

The Barrier Islands are not listed as localities for *Phenacohelix hakarimata* in Goulstone's paper. However, he assured me that it is present on Great Barrier Island.
Goulstone Pers.Comm. *P. hakarimata* and *P. ponsonbyi* are not listed on the Auckland Museum Data base.

***Placostylus (Maoristylus) hongii* (Lesson, 1830)**
A colony of *Placostylus hongii* were once present at Matawhauwhau Point, Great Barrier Island - in scrub and bush. Beverley Elliott (Pers. Com.) SO9/290415 Approx. 1955
D.O.C. Rangers are to investigate this area.

While on a University trip, approximately 1940, Noel Gardner (nee Houghton) observed specimens of *Placostylus* on the northern headland, Whangaparapara Harbour, (under flax bushes). D.O.C. Ranger (Whangaparapara) to investigate. Approx. SO9/255469

C.C. Ogle, Tane 27, Page197, 1981.
Placostylus hongii
"No live or dead specimens were found, nor any reports of recent sightings. Powell (1938) listed three Great Barrier Island localities where living specimens had been known . 1913 (an old pa sight midway round Tryphena Bay), 1924(Maori Bay), and 1938 (headland at north end of Schooner Bay). The identity of "Maori Bay" could not be determined, nor the precise identity of the headland at Schooner Bay. Hills and much of the coast were surveyed from Schooner Bay to Shag Point and northwards. "

The Genus *Placostylus* In New Zealand Rec.Auck. Inst & Mus.,
Vol 2, No 3, Page 145-146, 1938 A.W.B. Powell

Placostylus hongii
"Great Barrier Island, an old pa site midway round Tryphena Bay, last living specimen taken by Mr. J Blackwell about 1913; Formerly abundant there but only bleached fragments now remain: Maori Bay, three fresh specimens taken after a burn in April 1924(Mr W. La Roche); headland at northern end of Schooner Bay (Messers. H. Osbourne and N.H. Goulstone), living specimens taken:"

***Paryphanta busbyi busbyi* (Gray 1840)**
Roumours of the large Kauri Snail - *Paryphanta busbyi busbyi* persist.
The Great Barrier Form is said to posses a **red umbilicus**. Most reports date back 20 - 30 years. (Goulstone Pers Comm.)

Noel Gardner reports that the locality for *P. busbyi busbyi* was in the vicinity of Mt. Hobson (Hirakimata). This was conveyed by word of mouth after University trips to Great Barrier Island , approximately 60 years ago.

Great Barrier Landsnails March, 1990 J.F. Goulstone
Poirieria Vol 16, No 3, Page 8, July, 1991
"One day, while passing the school at Okiwi, I, (Goulstone) stopped for a drink of water. Some parents were helping their children plant some seed in the flower garden and one of the mothers told me she had found a *Paryphanta* shell at Windy Canyon, though in the scrub between the road and the cliffs. I wasn't able to find anyone who had a shell still in their possession but was always being told of someone else who had one."
***Schizoglossa novoseelandica barrierensis* Powell, 1949**

Powell, 1949B, page 367.
Schizoglossa novoseelandica barrierensis N.Subsp. Pl. 65, fig 14; text figs 9,10, 10a. Shell oblong - ovate with a small spire about one-seventh the length, sculptured with radial slightly fleouous impressed linear striations, not malleated. The umbilicus is overshadowed by the parietal callus. The outline is similar to that of the typical species except that the shell is relatively eider and is not narrowly contracted anteriorly.
Length, 20mm; diameter, 13.25mm; thickness, 6.25mm (holotype).(See table (B) 4, for range of dimensions.)
Locality: Tryphena, near divide between west and east coasts, Great Barrier Island (C. Osborne, April, 1924).Holotype and two Paratypes, Powell Collection, Auckland Museum.

C.C. Ogle, Tane 27, Page 197, 1981
Schizoglossa novoseelandica
A number of specimens were found under logs and rocks in forest but only in Needle Rocks Scenic Reserve. One was found with eggs.
J. McCallum (pers. Comm.) reported that *Schizoglossa* is widespread on Great Barrier.
The species was first collected on Great Barrier Island by C. Osborne in 1924, apparently in the Needle Rocks area, and was described by Powell (1949) as an endemic Great Barrier subspecies, *S. novoseelandica barrierensis*. Parkinson (1979) did not support its separation at subspecific level.

Needle Rocks Scenic Reserve is situated on the track to Needle Rocks,
Summit --- Tryphena - Medlands Hill

Type Locality: Tryphena, near divide between west and east Coasts, Great Barrier Island, (Southern Zone)

Needle Rocks Scenic Reserve, Tryphena - Medlands Hill C.C. Ogle, 1981
Needle Rocks, Tryphena - Medlands Hill F.Brook 14/10/1994 T09/334430
Summit, Tryphena - Medlands Hill Peter Poortman March 1999
Locality 32) Summit Track, Tryphena - Medlands Hill B.F.H 27/11/2001 T09/341431
Valley under Mt. Hobson (on the Fitzroy Harbour side) Ted Milligan
Found near the Whangaparapara Hut (Central Zone) J.F.Goulstone 1991
Locality) Witheys Track, Whangaparapara B.F.H. 3/10/2001
Locality 24) Tramline Track nearing Claris Road Track, Whangaparapara. B.F.H. 7/10/2001 S09/264498

Rhytida greenwoodi greenwoodi **(Gray 1850)**
C.C. Ogle, Tane 27, page 197, 1981
Rhytida greenwoodi
Empty shells were found at several sites in the Northern Block of forest, and one was collected for the National Museum, Wellington. One live animal was found, and returned to its habitat, in the valley running south from Rangiwhakaea Bay.
This appeared to be the first record from the island of the species, otherwise known from Auckland to Marlborough (Parkinson 1979). Hayward (1981) records it from Rakitu (Arid) Island, 2.5 km from Great Barrier

1982 F.J. Brook, J. McCallum & E.K. Cameron
Only one land snail species is recorded from Rakitu Island (Arid Island)

Rhytida greenwoodi greenwoodi.[2]
Unfortunately the North Island Weka[3] *Gallirallus australis* has been liberated on Rakitu Island (1951). This could render *Rhytida greenwoodi greenwoodi* locally extinct. Good bush is recorded, similar to that from the Northern Zone.

"At Rakitu Island, living *R .greenwoodi* were only found near Te Akau Point, although old dead specimens occur sporadically in bushed areas throughout the western part of the island. The living snails occur in a small west-dipping gully at 100-160mm elevation, south of Pinnacle Hill. Canopy vegetation at this locality is dominated by taraire (*Beilschmiedia tarairi*) with less - common kohekohe (*Dysoxylum spectabile*), and a diverse understorey including nikau (*Rhopalostylis sapida*), pigeonwood (*Hedycarya arborea*) and kawakawa (*Macropiper excelsum*).
This gully is unique on Rakitu Island in having vegetation undamaged by browsing and is thus apparently inaccesable to the islands cattle. The forest floor here is covered in broadleaf litter throughout which dead *R.greenwoodi* shells are scattered. The majority of shells are old and bleached, but a few have traces of periostracum remaining. In the lower part of the gully, adjacent to steep coastal cliffs, loose rocks are abundant on the forest floor, and it is under these that living *R. greenwoodi* occur."

Rhytida greenwoodi greenwoodi (sensu stricto) is present in the Northern Zone, Great Barrier Island, Rakitu Island; Auckland (Type), Waiheke Island ;Coromandel Penninsula ,Cuvier Island; Slipper Island and many localities south of Auckland.

Where are the early collections?
The Ballance Collection is in The Museum of New Zealand, Wellington.
The whereabouts of the Milligan Collection is not known.
The Jim Goulstone Collection is housed in the Auckland Museum.
A survey was undertaken by Pauleen Mayhill of Little Barrier Island during August 1983. Two records appear in - Naturalised terrestrial *Stylommatophora*
Gary M. Barker, Fauna of New Zealand, Number 38.
Helicodiscus (Hebetodiscus) singleyanus (Pilsbry, 1889)
Oxychilus (Oxychilus) alliarius (Miller, 1822)

A further record from Little Barrier Island P.C. Mayhill, SO8, M 79390, 1/8/83
Climocella triticum Goulstone & Mayhill, 1998

Pauleen Mayhill was killed in a road accident near Blenheim 21/12/2001. It is not known what will happen to her collection as yet.

The Mayhill collection of Little Barrier Island snails is housed at The Museum of New Zealand, Wellington.

Some Little Barrier Island landsnails are housed in the Auckland Museum. (P.M.)

The A.E Brookes Landsnail Collection is in the Auckland Museum.

Some of J.G Edwards Collection are in the Auckland Museum.

Some of E.W. Perks Collection are in the Auckland Museum.
No terrestrial molluscs are recorded from The Aiguilles Islands (The Needles/The Needle Rocks)

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2 The authors consider *Rhytida greenwoodi webbi* Powell, 1949 and *Rhytida greenwoodi stephenensis* Powell, 1930 to be valid species, each in its own right. The type of *R. greenwoodi* (Gray, 1850) comes from Auckland (collected by Greenwood) These specimens display a brown umbilicus. A second form lives in the southern North Island, they have a green umbilicus.

3 Weka - a Native New Zealand semi-flightless bird

No terrestrial molluscs are recorded from Kaikoura Island (Selwyn Island)?
Kaikoura Island is privately owned and is covered in gorse. Little native vegetation is obvious!
(Pers. Com. - Chris Green - D.O.C., Auckland.)
This island should be purchased by the Government and then be returned to its former glory. Remnant populations of snails, slugs, insects, spiders, worms, lizards etc., will eventually recolonize the island. Introductions may already have reached critical levels!
No terrestrial molluscs are recorded from The Broken Islands (Pig Islands)

Notes

1) Vegetation - *Coprosma sp.*[4]
2) Specimens of *Laoma pirongiaensis* display a different form to those from the Coromandel Peninsula. This sculpture is characterised by its strong sinuous axials. Possibly a new species!
3) *Liarea egea egea* - this is a small form.
4) *Liarea sp (cf turriculata)* These specimens are not *Liarea egea egea*!
They are reminicent of those from north of Auckland; attributable to *Liarea turriculata.* Specimens from both Gt. Barrier and north of Auckland have a lower, fatter profile than typical *L. turriculata.*
5) The specimen of *Phrixgnathus douglasi* Climo & Goulstone illustrated in that paper has close axials, not having horizontal interstitial sculpture, typical of *P. douglasi.*
6) *Cytora septentrionale* surprisingly has not been collected to date. This is one species we would expect to find!
7) The local form of *Flammulina feredayi* differs from its type.
Flammulina feredayi feredayi (Suter, 1891) Forty Mile Bush, Wairarapa. (Type)

Two forms of '*Flammulina feredayi*'[5] are present in Auckland
- a) Hunua Ranges (white specimens)
- b) North Shore (straw - golden colour)

List of species recorded by Norm Gardner
Medland Road, Oruawharoa, Medlands Beach - 1966 (Southern Zone)
Coll. Mrs. Gaye Mitchener

1) *Liarea egea*	
2) *Cytora torquilla*	
3) *Tornatellinops novoseelandica*	
4) *Charopa coma*	
5) *Charopa ochra*	*Chaureopa titirangiensis*
6) *Fectola buccinella*	*Cavellia buccinella*
7) *Ptychodon pseudoleioda*	*Huonodon pseudoleioda*
8) *Ptychodon hunuaensis*	*Huonodon hectori*
9) *Subfectola caputspinulae*	*Mocella eta*
10) *Geminoropa subantialba*	*Geminoropa nsp (aff cookiana)*
11) *Flammulina costulata*	*Flammocharopa costulata*
12) *Therasiella celinde*	
13) *Therasiella tamora*	

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4 The obvious vegetation in the Southern Zone, Great Barrier Island (Aotea Island) is a new species - *Coprosma (aff macrocarpa).* There are two forms of this species
a) Coastal Form - hardy
b) Bush Form - has a soft leaf
This species has been known for over 20 years. There is an occasional hybrid mix -
C. (aff macrocarpa) / C. robustum.
Coprosma macrocarpa is a distinct species, living only on the Three Kings Islands - Pers. Com. Euan Cameron
5 Single quotation marks are used to indicate a N.gen. & nsp that differs from that quoted.

14) *Suteria ide*
15) *Allodiscus planulatus*
16) *Laoma marina*
17) *Laoma leimonias*
18) *Phrixgnathus ariel*
19) *Phrixgnathus cheesmani*
20) *Phrixgnathus erigone*
21) *Delos coresia*

Mollusc Species List of Little Barrier Island E.N. Milligan & J.J.Sumich
Tane 6, pages 123-24

Hydrocenidae
**Hydrocena purchasi* 494 - Common on ferns, Hingaia. (Coll. J. Edwards)

Cyclophoridae
+*Murdochia cytora* 540 - one spec., Nikau debris, head of Waipawa.

*+*Murdochia pallida* 545 - 1 spec., Awaroa Stream. Abundent in leafmould, Karaka, *Macropiper* etc., Hingaia, Whekau, Awaroa etc.

Liareidae
**Liarea carinella* 571 - leaf mould, Hingaia and Awaroa - uncommon.
*+*Liarea turriculata* 574 - common in leaf mould. Haowhenua,Te Wairere and Hingaia.

Flammulinidae
**Thalassohelix zelandiae* 1500 - soil under rocks, nikau fronds. Hingaia, Whekau and Awaroa - common
**Allodiscus planulatus* 1512 - 1 spec., Awaroa (Coll. E.N.M.)
*+*Allodiscus urquharti* 1517 - uncommon, leaf mould. Head of Waipawa Stream and Hingaia.
*+*Serpho kivi* 1526 - nikau fronds, Te Wairere, Te Waikohare, Awaroa, Whekau, and Hingaia.
*+*Therasiella celinde* 1531 - not uncommon, beech humus, Thumb Track, Waipawa and above Hingaia.
*+*Therasiella tamora* 1534 - uncommon, Waipawa and Hingaia
*+*Therasia decidua* 1532 - common in mould or crawling on forest floor, coastal and Thumb Track.
*+*Phenacohelix ponsonbyi* 1538 - abundent, coastal nikau groves and Thumb Track.
**Suteria ide* 1545 - common in fallen nikau fronds and forest debris; 1 spec., flax 1800' Thumb Track.
**Flammulina chiron* 1547 - 1 spec., nikau, Whekau.
* ± *Flammulina feredayi* 1553 - uncommon, Summit Track and Hingaia.
**Flammulina perdita* 1557 - coastal leaf mould, Hingaia, uncommon
**Flammulina pilsbryi* 1559 - 1 spec,. flax, 2100 ft., Thumb Track.

Otoconchidae
+*Otoconcha dimidiata* 1489 - 1 spec., *Cyathea* debris, Waipawa.

Charopidae
+*Ptychodon tau?* 1564 - 4 riblets/mm., on all but last whorl which has 8. Bifid lamella on body whorl. 1 spec., Thumb Track.
+*Ptychodon hectori* 1569 - 1 spec., moss, Summit Track; 1 spec., nikau debris, Haowhenua
+*Charopa coma* 1588 - common, leaf mould & soil under rocks.
Fectola colensoi 1603 - recorded by Adams, not found on trip.

Fectola roseveari 1610 - 1 spec., soil under rocks, Hingaia. (J. Edwards)
±*Fectola sp. (cf sterkiana)* 1611 - approx., 22 riblets/mm.,v. low spiral, 2 spec., on moss, Summit Track. (J. Fawcett)
**Fectola (Subfectola) caputspinulae* 1615 - uncommon, leaf mould, Hingaia.

Laomidae
**Laoma leimonias* 1630 - not uncommon, leaf mould, Waipawa.
+*Laoma pirongiaensis* 1634 - abundent, especially in beech leaf mould, Thumb Track and Waipawa Valley.
Laoma poecilosticta 1635 - 3 spec., leaf mould under rocks, Hingaia.
*+*Phrixgnathus mariae* 1639 - 2 spec., nikau debris, 1200ft, Thumb Track, soil under rock, Hingaia.
+*Phrixgnathus allochroidus?* 1640 - beech debris, Thumb Track. Not uncommon.
+*Phrixgnathus ariel* 1642 - 1 spec., leaf mould in kauri, 480ft, Thumb Track.
+*Phrixgnathus cheesemani* 1643 - 1 spec., Haowhenua,1 spec.,Waipawa.
**Phrixgnathus conella* 1644 - uncommon, nikau leaves, Hingaia; ferns, Hingaia under rock; *Muehlenbeckia,* Westlanding.
+*Phrixgnathus sublucidus?* 1649 - beech debris, Thumb Track, not uncommon.
+*Phrixgnathus erigone* 1658 - not uncommon, nikau debris, Waipawa.
*+ ±*Phrixgnathus glabriusculus* 1660 - common, nikau; uncommon in leafmould.
North Titoki Pt., Waipawa and Hingaia.
±*Phrixgnathus microreticulatus* 1665 - 1 spec., on moss Summit Track. (J. Fawcett)
+*Paralaoma lateumbilicata* 1680 - coastal bush between Waipawa and Haowhenua.

Paryphantidae
**Delos coresia* 1735 - coastal leaf mould, 2 spec., (J. Edwards).
**Delos jeffreysiana* 1736 - damp leaf mould above Hingaia, near Kauri Knoll and in Kauri Gulley, 3 spec.

Athoracophoridae
*+*Athoracophorus bitentaculatus rufovenosus* 1739 - 1 spec., *Astelia*; Base of nikau sheaths, Hingaia, Whekau and Te Waikohare,common.
**Vomanus marmoreus* 1740 - common in nikau bases.

* Coll. By J .Sumich et.al. - May 1952.
\+ Coll by E.N. Milligan - August 1954
± Coll. By J. Fawcett and E. White - July 1953

Land Snails of Little Barrier Island Tane 28, 1982 A.P. Ballance
Introduction
"Work on the land snails of Little Barrier Island was carried out during the Auckland University Field Clubs scientific trip from 17 August to 26 August 1981.
Little Barrier Island (Hauturu) lies 26 kilometres off Leigh, 80 kilometres north of Auckland City, has an area of 2817 hectares and rises to a height of 722 metres.
It was declared a bird sanctuary in1894 and is now a flora and fauna reserve administered by the Hauraki Gulf Maritime Park Board. Previous work on Little Barrier Islands land snails has been published by Milligan and Sumich (1953).
The collection of specimens is housed in the National Museum of New Zealand in Wellington."

Methods
"Fifteen sites along the Summit Track and Thumb Track were sampled at 50 metre altitude intervals. At each site a 10 by 10 metre quadrant was laid out and the dominant vegetation within

the quadrant was noted. A leaf litter sample was collected for a later moisture analysis. An hour was spent collecting snails in the leaf litter and under fallen logs and branches, and a further 10 by 10 centimetre bag of litter was taken for later sorting. (See Fig.1 for position of sites)"

Discussion (in part)
"Since collecting on this trip was confined to the south - western corner of the island, as compared to the more comprehensive survey of Milligan and Sumich (1953), the species list could conceivably be extended by sampling in other habitats on the island.
In addition, since the collecting method concentrated on leaf litter and fallen logs, arboreal species are poorly represented, except for occasional dead shells in the litter (see Appendix 1 for revised list of species).
Although slugs were not included in this study, it is worth mentioning that several individuals of an unidentified introduced species were collected at each of sites
1 to 5, all of which were in close proximity to the farmland and garden on the coastal flat. One introduced snail was found, a partially decomposed specimen of the
Genus - *Oxychilus*. In addition, one *Helix aspersa* was found amidst drift debris on the beach, but its place of origin is unknown."

"A point of note is the occurrence of *Phrixgnathus cheesemani* on Little Barrier Island - it is easily the most abundant of the species collected in this study, yet it is now very rare on the mainland, with only two specimens existing in the reference collection of the National Museum (F. M. Climo pers. comm.)"

Species List

Liareidae		
Cytora cytora	1953,1981	
Cytora pallida	1953	
Cytora torquilla	1981	
Liarea hochstetteri carinella	1953	
Liarea egea egea	1981	
Liarea turriculata	1953	
Charopidae		
Charopa coma	1953, 1981	
'Charopa' chrysaugeia	1981	*Paracharopa chrysaugeia*
'Charopa' pilsbryi	1953, 1981	
'Charopa' pseudanguicula	1981	*Phenacharopa pseudanguicula*
Flammocharopa costulata	1981	
Fectola infecta	1953	= *Ptychodon tau*
Huonodon hectori	1953, 1981	
Cavellia cf serpentinula	1981	
Cavellia cf sterkiana	1953	
Cavellia colensoi	1953	
Cavellia roseveari	1953	
Cavellioropa cf microrhina	1981	*Geminoropa nsp (aff cookiana)*
Flammulina chiron	1953	
Flammulina perdita	1953	
'Flammulina' feredayi	1953, 1981	
Therasia decidua	1953, 1981	
Serpo kivi	1953, 1981	
Therasiella celinde	1953	

Therasiella tamora	1953	
Phenacohelix giveni	1953, 1981	
Suteria ide	1953	
Mocella eta	1981	
Allodiscus planulatus	1953	*Allodiscus nsp 1*
'Allodiscus' urquharti	1953, 1981	
Otochoncha dimidiata	1953	
Punctidae		
Laoma leimonias	1953, 1981	
Laoma pirongiaensis	1953, 1981	
Laoma poecilosticta	1953, 1981	
Paralaoma lateumbilicata	1953, 1981	
'Paralaoma' serratocostata	1981	
Punctid nsp 1	1981	
Punctid nsp 6	1981	
Punctid nsp 29	1981	
Punctid nsp 30	1981	
Punctid nsp 32	1981	
Punctid nsp 33	1981	
Punctid nsp (aff) nsp 33	1981	
Punctid nsp 38	1981	
Phrixgnathus allochroidus	1953	
Phrixgnathus ariel	1953	
Phrixgnathus cheesemani	1953, 1981	
Phrixgnathus conella	1953, 1981	
Phrixgnathus erigone	1953, 1981	
Phrixgnathus glabriusculus	1953, 1981	
Phrixgnathus mariae	1953	
Phrixgnathus microreticulatus	1953	
Phrixgnathus moellendorffi	1981	
Phrixgnathus viridulus	1981	
Phrixgnathus nsp 40	1981	
= *Phrix. brunneus* Climo&Goulstone		
Phrixgnathus nsp 59	1953, 1981	
Rhytididae		
Delos coresia	1953, 1981	
Delos jeffreysiana	1953, 1981	
Zonitidae		
Oxychilus sp.	1981	

Present Usage 1981	**Milligan & Sumich, 1953**
Therasia decidua	*Therasia decidua and T. zelandiae*
Phenacohelix giveni	*Phenacohelix ponsonbyi*
Mocella eta	*Fectola (Subfectola) caputspinulae*
Phrixgnathus nsp 59	*Phrixgnathus glabriusculus*

Comments on the 1981 list

Cavellia cf sterkiana	Possibly a nsp from the central North Island. (sunken spire?)
Cavellia colensoi	Could be *C. colensoi?* More likely to be *C. anguicula.*

Phrixgnathus glabriusculus Is this duplication for *Phrix. nsp 59?* : or maybe -
Phrixgnathus glabriusculus = *Phrixgnathus lucidus* (Climo unpublished)

Many of the 1953 records need verification!

Locality Lots Museum of New Zealand (still to access)
1) Pauleen Mayhill Little Barrier Island August, 1983

Auckland Museum Collections AK Numbers (TYPES)
HOLOTYPE
Tryphena, near divide between east and west coast, Great Barrier Island. C. Osborne -/4/1924
AK72201 *Schizoglossa novoseelandica barrierensis* (1 specimen)

PARATYPES
Tryphena, near divide between east and west coasts, Great Barrier Island. C.Osborne -/4/1924
AK71494 *Schizoglossa novoseelandica barrierensis* (2 specimens)

Lots, Auckland Museum ("L" numbers)
1) J.F. Goulstone 1981 Great Barrier Island
2) J.F. Goulstone 1990 Great Barrier Island
3) N.H. Goulstone - - - -?

L10024 - Whangaparapara Hut, Great Barrier Island (Nikau) (J.F. Goulstone) 12/1/81 - S08/264501
L10044 - Selwyn Track, Kiarara, Great Barrier Island (Puriri) (J.F. Goulstone) 1/1/81 - S08/247548
L10058 - Whangaparapara Hut, (Site 9), Great Barrier Island (Rimu) (J.F. Goulstone) 1/1/81 - S09/264501
L10065 - Harataonga Scenic Reserve, Great Barrier Island (general collecting) J.F. Goulstone - 25/3/90 - S08/267580
L10185 - Kiarara River, Site 13, Great Barrier Island (Nikau) (J.F. Goulstone) 25/3/90 - S08/247547
L10207 - Mt. Hirakimata, Great Barrier Island Sites 15 - 19 (J.F.Goulstone) 23/3/90 - S08/275543
L10208 - Kiarara River, Great Barrier Island. (In Nikau) (J.F. Goulstone) 23/3/90 - S08/247547
L10948 - Waterfall up the valley, behind the DOC office, Great Barrier Island. (J.F. Goulstone) - 28/3/90 S08/236562
L17722 - Point just to the north of Schooner Bay, Great Barrier Island. (N.H. Goulstone) - T09/- - -
L20033 - Kaitoke Swamp, Great Barrier Island. (On the edge) (J.F. Goulstone) 11/1/81 - S08/292511
L3288 - Kaitoke Springs Track, Great Barrier Island. Site 1 (Under Puriri and Tawa) - (J.F. Goulstone) 11/1/81 - S08/286495
L3289 - Kaitoke Springs Track, Great Barrier Island. (Site 2) (Under Tawa and Nikau) - (J.F. Goulstone) 11/1/81 - S08/286495
L3290 - Kaitoke Springs Track, Great Barrier Island (Site 3) (Under Puriri and Ti Tree) - (J.F. Goulstone) 11/1/81 - S08/286495
L3291 - Kaitoke Springs Track, Great Barrier Island. (Site 4) Collected in Nikau fronds. (J.F. Goulstone) 11/1/81 - S08/286494
L3292 - Whangaparapara Hut, Great Barrier Island. (Site 6) In fallen epiphyte - (J.F.Goulstone) 12/1/81 S09/ - - - - - -
L3293 - Whangaparapara-Kiarara, Great Barrier Island. (Site 7) (Under Nikau) -(J.F. Goulstone) 12/1/81 S08/257508
L3294 - Whangaparapara-Kiarara, Great Barrier Island. (Site 8) under Rimu on Pack Track (J.F. Goulstone) 12/1/81 - S09/264501
L3295 - Near Whangaparapara Hut on Pack Track,Whangaparapara - Kiarara, Gt Barrier Island (under Nikau) (J.F. Goulstone) 12/1/81 S09/264501
L3296 - Pack Track, near Whangaparapara Hut, Whangaparapara - Kiarara, Gt Barrier Island. (Site 10) (under Tawa) (J.F. Goulstone) 12/1/81 09/264501
L3297 - Along the Track collected on the spot, Whangaparapara - Kiarara, Great Barrier Island. (Site 11) (J.F. Goulstone) 14/1/81 S08/264501
L3298 - On Selwyn Track, Kiarara Hut, Gt Barrier Island. (Site 13) (in Nikau fronds) (J.F. Goulstone) 13/1/81 S08247548 - L3299 - On The Selwyn Track, Kiarara Hut, Great Barrier Island. (Site 14) (Puriri) (J.F. Goulstone) 13/1/81 S08/247548
L3300 - Kiarara Hut, Great Barrier Island. (Site 15) (J.F. Goulstone) 13/1/81 S08/247548
L3301 - On track to the dams, Kiarara Hut, Great Barrier Island. (Site 16) (under Taraire) - (J.F. Goulstone) 13/1/81 S08/246547
L3302 - Mt. Heale, Great Barrier Island. (Site 17) (under Ti Tree) (J.F. Goulstone) 14/1/81 - S08/282531
L3303 - Peach Tree Springs, Great Barrier Island. (Site 18) (under Rimu) (J.F.Goulstone) - 14/1/81 S08/293514
L3304 - Peach Tree Springs, Great Barrier Island. (Site 19) (under Rimu and Taraire) - (J.F. Goulstone) 14/1/81 S08/293514
L3306 - Collected along the track, Northern Block,Great Barrier Island. (Site 20) - (J.F. Goulstone) 24/3/90 S08/ - - - - - -
L3307 - Northern Block, Great Barrier Island. (Site 21) (under a large Totara) (J.F. Goulstone) - 24/3/90 S08/267632
L3308 - Northern Block, Great Barrier Island. (Site 23) (under Puriri) (J.F. Goulstone) 24/3/90 - S08/268635
L3309 - Northern Block, Great Barrier Island. (Site 24) (under Rimu) (J.F. Goulstone) 24/3/90 - S08/269634
L3310 - Northern Block, Great Barrier Island (Site 25) (under Tree Fern) (J.F. Goulstone) - 24/3/90 S08/269634
L3311 - Northern Block, Great Barrier Island. (Site 26) (under Rata) (J.F. Goulstone) 24/3/90 - S08/369618
L3312 - Kaitoke Springs, Great Barrier Island. (Site 22) (under Taraire) (J.F. Goulstone) - 13/1/81 S08/282503
L3313 - Harataonga Reserve, Great Barrier Island. (Site 3) General collecting (J.F. Goulstone) - 25/3/90 T08/308555
L3314 - Harataonga Reserve, Great Barrier Island. (Site 7) (under Taraire) (J.F. Goulstone) - 25/3/90 T08/308555
L3316 - Harataonga Reserve, Great Barrier Island (Site 6) (under Tawa) (J.F. Goulstone) - 25/3/90 T08/308555
L3317 - Harataonga Reserve, Great Barrier Island. (Site 4) (under Taraire) (J.F. Goulstone) - 25/3/90 T08/308555
L3318 - Old Lady Walk, Port Fitzroy, Great Barrier Island. (Site 8) (under Puriri) - (J.F. Goulstone) 26/3/90 S08/235574
L3319 - Old Lady Walk, Port Fitzroy, Great Barrier Island.(Site 9) (under Puriri) - (J.F. Goulstone) 16/3/90 S08/235574
L3320 - On the Northern side of the harbour from the wharf, Port Fitzroy, Great Barrier Islan. - (Site 10) (J.F. Goulstone) 26/3/90 S08/226567
L3321 - On the northern side of the harbour from the wharf, Great Barrier Island. - (Under Ti Tree) (J.F. Goulstone) 26/3/90 S08/220567
L3322 - Eastern side, Mt. Hirakimata, Great Barrier Island. (Sites 15 & 16) (Rimu) - (J.F. Goulstone) 23/3/90 S08/275543
L3323 - Eastern Summit Ridge, Mt. Hirakimata, Great Barrier Island.(under cutty grass) - (Site 19)(J.F. Goulstone) 23/3/90 S08/275543
L3324 - Western Side of Summit,Mt. Hirakimata, Great Barrier Island. (Site 18) (under Rimu) - (J.F. Goulstone) 23/3/90 S08/275543

L3325 - Around the waterfall on the track behind the D.O.C. Office, Port Fitzroy, - Great Barrier Island. (Site12) (J.F. Goulstone) 23/3/90 S08/236562
L3326 - Kiarara River, Great Barrier Island. (Site 13) (in Nikau) (J.F. Goulstone) 25/3/90 - S08/247548
L3327 - Halfway up the hill on the eastern side,Fitzroy Road, Okiwi, Great Barrier Island. - (Site 2) (under Taraire) (J.F.Goulstone) 27/3/90 S08/253573
L3365 - Windy Canyon, Great Barrier Island. (Site 14) (Amongst rocks and scrub) - (J.F.Goulstone) 25/3/90 S08/295539
L3768 - Mt. Hirakimata, Great Barrier Island. (Sites !5 - 19) (J.F.Goulstone) 24/3/90 S08/275543 -
L3769 - Northern Block, Great Barrier Island. (Site 22) (under Puriri) (J.F.Goulstone) 24/3/90 - S08/269618
L3370 - Okiwi Swamp, Great Barrier Island. (Site 1) (J.F.Goulstone) 27/3/90 S08/267580
L7703 - Mt. Hirakimata, Great Barrier Island. (J.F.Goulstone) 23/3/90 S08/276543
L7778 - Whangaparapara Road, Great Barrier Island. (Site 5) - -/- -/- - (J.F.Goulstone) - S08/ - - - - - -
L7784 - Near Kaitoki Springs, Great Barrier Island. (Site 21) (J.F.Goulstone) 14/1/81 - S08/282503
L7806 - Harataonga Reserve, Great Barrier Island. (J.F.Goulstone) 25/3/90 T08/308555
L8307 - Kiarara Hut - Whangaparapara, Great Barrier Island. (Site 12) (collected on the spot) - (J.F.Goulstone) 12/1/81 S08/257508
L8443 - Near Mt Heale, Great Barrier Island. (J.F.Goulstone) 1/1/81 S08/282531
L9163 - Kaitoke Swamp, Great Barrier Island.(under Tawa and Nikau) (J.F.Goulstone) - 11/1/81 S09/286495
L9541 - Peach Tree Springs, Great Barrier Island. (Site 23) (J.F.Goulstone) 14/1/81 - S08/293514
L9640 - Whangaparapara Hut, Great Barrier Island. (J.F.Goulstone) 1/1/81 S09/ - - - - - - - NZMS 259 reference = 647745
L9687 - Great Barrier Island. NZMS 259 reference = 744644 (J.F. Goulstone) 1/1/81 - S0- / - - - - - -

Species List : The Barrier Islands

Class	*GASTROPODA*
Subclass	*PROSOBRANCIA*
Order	*MESOGASTROPODA*

Hydrocenidae
1) *Georissa purchasi* (Pfeiffer, 1862)

Pupinidae : Liareinae
2) *Liarea egea egea* (Gray,1850)
3) *Liarea hochstetteri* (Pfeiffer, 1861) (Little Barrier Is.)
4) *Liarea turriculata* (Pfeiffer, !855)
5) *Cytora cytora* (Gray,1850)
6) *Cytora pallida* (Hutton, 1883 (Little Barrier Is.) (identity in doubt) Possibly *Cytora septentrionale*
7) *Cytora torquilla* (Suter, 1894)

Hydrocenidae (Freshwater)
8) *Potamopyrgus antipodarum* (Gray, 1843)
9) *Potamopyrgus esturinus* Winterbourn, 1971?

Class	*GASTROPODA*
Subclass	*PULMONATA*
Order	*STYLOMMATOPHORA*

Latiidae (Freshwater)
10) *Latia neritoides* Gray, 1850

Athoracophoridae
11) *Athoracophorus bitentaculatus rufovenosus* Suter, 1909 (Little Barrier Is.)
12) *Reflectopallium (aff mamoratum)* Little Barrier Is.) (Nsp?)
(Not Auckland Island species) - identity in doubt.

Achatinellidae : Lamellideinae
13) *Tornatellinops novoseelandica* (Pfeiffer, 1853)

Charopidae : Rotodiscinae
14) *Huonodon hectori* (Suter, 1890)
15) *Huonodon pseudoleioda* (Suter, 1890)

Charopidae : Charopinae

16) *Cavellia buccinella* (Reeve, 1852)
17) *Cavellia (aff colensoi)* (Little Barrier Island)
18) *Cavellia roseveari* (Suter, 1896)
19) *Cavellia (cf serpentinula)* (Little Barrier Is.)
20) *Cavellia (aff sterkiana)* (Little Barrier Is.)
21) *Fectola infecta* (Reeve, 1852)
22) *Fectola unidentata* Climo, 1978
23) *Pseudegestula montivaga* Suter, 1894
24) *Pseudegestula transenna* (Suter, 1904)
25) *Phenacharopa pseudanguicula* (Iredale, 1913)
26 *Phenacharopa nsp (aff. pseudanguicula) (Sp. 2000 :Charopid nsp 137)*
27) *Charopa coma* (Gray, 1843)
28) *Geminoropa nsp (aff cookiana) (Sp. 2000 : ?)*
29) *Paracharopa chrysaugeia* (Webster, 1904)
30) *Paracharopa goulstonei* Climo, 1983
31) *Chaureopa titirangiensis* (Suter, 1896) = *ochra*
32) *Mocella eta* (Pfeiffer, 1853)
33) *Climocella akarana* Goulstone, 1996
34) *Climocella haurakiensis* Goulstone, 1996
35) *Climocella intermedia* Goulstone, 1996b (Little Barrier Island)
36) *Climocella kaitaka* Goulstone, 1996
37) *Climocella triticum* Goulstone & Mayhill (Little Barrier Is.)
38) *Climocella nsp 9* Goulstone MS
39) *Charopa parva*
40) *"Charopa" (aff pilsbryi) (Sp. 2000 : Charopid nsp 37)*
41) *Flammocharopa accelerata* (Climo, 1970)
42) *Flammocharopa costulata* (Hutton, 1883)

Charopidae : Flammulininae

43) *Flammulina cornea* (Hutton, 1883)
44) *Flammuli(aff feredayi feredayi) (Sp. 2000 : ?)*
45) *Flammulina perdita* (Hutton, 1883)

Charopidae : Phenacohelicinae

46) *Allodiscus dimorphus* (Pfeiffer, 1853)
47) *Allodiscus miranda* (Hutton, 1883)
48) *Allodiscus urquharti* Suter, 1894
49) *Allodiscus nsp 1 (planulatus) (Sp. 2000 : ?)*
50) *Allodiscus nsp 2* (Gt. Barrier) (endemic form of *Phenacohelix pilula* ?)
51) *Phenacohelix hakarimata* Goulstone, 2001?
52) *Phenacohelix giveni* Cumber, 1961
53) *Phenacohelix pilula* (Reeve, 1852)
54) *Thalassohelix zelandiae* (Gray,1843)
55) *Therasia decidua* (Pfeiffer, 1857)
56) *Therasia traversi* (E.A. Smith, 1884)
57) *Serpho kivi* (Gray, 1843)
58) *Suteria ide* (Gray, 1850)

Charopidae ?

59) *Therasiella celinde* (Gray, 1850)
60) *Therasiella neozelanica* Cumber, 1967

61) *Therasiella serrata* Cumber, 1967
62) *Therasiella tamora* (Hutton, 1883)
63) *Therasiella nsp (aff neozelanica)* *(Sp. 2000 : ?)*

Punctidae
64) *Laoma marina* (Hutton, 1883)
65) *Laoma nsp (tall - aff marina)* *(Sp. 2000 : Punctid nsp 144)*
66) *Laoma liemonias* (Gray, 1850)
67) *Kokikora angulata* Climo & Goulstone,1995
68) *Phrixgnathus alfredi* (Suter, 1909)
69) *Phrixgnathus ariel* Hutton, 1883
70) *Phrixgnathus brunneus* Climo & Goulstone, 1993 (Little Barrier Island)
71) *Phrixgnathus cheesmani* Suter, 1894
72) *Phrixgnathus conella* (Pfeiffer, 1862)
73) *Phrixgnathus erigone* (Gray, 1850)
74) *Phrixgnathus fulguratus* (Suter, 1909)
75) *Phrixgnathus mariae* (Little Barrier Is.)
76) *Phrixgnathus microreticulatus* (Suter,1890) (Little Barrier Is.) (identity in doubt)
77) *Phrixgnathus moellendorffi* (Suter, 1896) (Little Barrier Is.)
78) *Phrixgnathus pirongiaensis* (Suter, 1894)
79) *Phrixgnathus poecilosticta* (Pfeiffer, 1853)
80) *Phrixgnathus serratocostatus* Webster, 1906
81) *Phrixgnathus sublucidus?* (Little Barrier Island) (identity in doubt)
82) *Taguahelix crispata* Climo & Goulstone 1993 = *(Punctid nsp 17)*
83) *Taguahelix francesci* (Webster, 1904) = *(Punctid nsp 7)* Goulstone
84) *Taguahelix viridula viridula* (Suter,1909)
85) *Paralaoma allochroida* (Suter, 1890) (Little Barrier Is.) (identity in doubt)
86) *Paralaoma lateumbilica* (Suter, 1890)
87) *Pasmaditta miserabilis* (Iredale, 1913)
88) *Obanella rimutaka* Dell, 1952
89) *Punctid nsp 1* *(Sp. 2000 : Punctid nsp203)*
90) *Punctid nsp 6* (Little Barrier Is.) *(Sp. 2000 : Punctid nsp186)*
91) *Punctid nsp 5* *(Sp. 2000 : Punctid nsp 81)*
92) *Punctid nsp 8* *(Sp. 2000 : Punctid nsp 72)*
93) *Punctid nsp 12* *(Sp. 2000 : Punctid nsp 67)*
94) *Punctid nsp 29* *(Sp. 2000 : Punctid 100)*
95) *Punctid nsp 30* (Little Barrier Is.) *(Sp. 2000 :Punctid nsp 204)*
96) *Punctid nsp 32* *(Sp. 2000 : Punctid nsp 81)*
97) *Punctid nsp 33* *(Sp. 2000 : = elaiodes)*
98) *Punctid nsp aff 33* (Little Barrier Is.) *(Sp. 2000 : ?)*
99) *Punctid nsp (Hirakimata)* Gt. Barrier *(Sp. 2000 : ?)*
100) *Punctid nsp 55* *(SP. 2000 : Punctid nsp 123)*
101) *Punctid nsp 59 (ex glabriusculus)* *(Sp. 2000 :Punctid nsp 56)*
102) *Punctid nsp (aff nsp 59 & moellendorffi)* *(Sp. 2000 :Punctid nsp 57)*
103) *Punctid nsp (aff conella)* Gt Barrier *(Sp. 2000 : ?)*
104) *Punctid nsp (aff lucidus [a])* Goulstone *(Sp. 2000 :Punctid nsp 171)*
105) *Punctid nsp (aff douglasi)* Climo & Goulstone(Little Barrier Is) *(Sp. 2000 : Punctid nsp ?)*
106) Punctid nsp (Little Barrier Island) *(Sp. 2000 Punctid nsp 216)*
107) Iotula nsp (Sp. 2000 : Punctid nsp 183) (Little Barrier Island)
108) Iotula nsp (Sp 2000 : Punctid nsp 187)

109) Iotula nsp (Sp. 2000 : Punctid nsp 186) (Little Barrier Island)

Otoconchidae
110) *Otoconcha dimidiata* (Little Barrier Is.)

Rhytididae : Rhytidinae
111) *Paryphanta busby busbyi* (Gray, 1840) (Locally extinct?)
112) *Rhyitida greenwoodi greenwoodi* (Gray, 1850)
113) *Schizoglossa novoseelandica barrierensis* Powell, 1949
114) *Delos nsp (multistriped)(aff coresia 4) - translucent*
115) *Delos nsp (cf jeffreysiana)*

Bulimulidae
116) *Placostylus (Maoristylus) hongii* Lesson, 1830 (Locally extinct?)

Introduced Species
Cochlicopidae
117) *Cochlicopa lubrica* (Müller, 1774)

Helicidae : Helicinae
118) *Cantareus aspersus* (Müller, 1774)

Zonitidae : Zonitinae
119) *Oxychilus alliarius* (Miller, 1822) (Little Barrier Is.)
120) *Oxychilus cellarius* (Müller, 1774)
121) *Oxychilus draparnaudi* (Beck, 1837 ?

Helicodiscidae
122) *Helicodiscus (Hebetodiscus) singleyanus* (Pilsbry, 1889) (Little Barrier Is.)

Testacellidae
123) *Testacella maugei* Férussac, 1819

Agriolimacidae
124) *Derocas (Agriolimax) reticulatum* (Müller, 1774)

Arionadae
125) *Arion sp (distinctus?)* Mabille, 1868

Limacidae
126) *Limacus flavus* (Linnaeus, 1758)

Vertiginidae
127) *Vertigo ovata* Say, 1822

Milacidae
128) *Milax gagates* (Draparnaud, 1801)

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Giant Squid Egg Mass, Poor Knights Islands Marine Reserve

by Jenny and Tony Enderby

In February 2002, while diving at Ngaio Rock, we came across a 2m wide circular mass, drifting with the current 10m below the surface. Closer examination revealed a thin, almost spiderweb-like texture. The cold current had brought in limited visibility with numerous pelagic salps and jellyfish. We photographed it with a diver behind for size comparison.

Leatherjackets nearby were more interested in feeding on the salps and jellyfish. Only a solitary sweep hung around in the hope of something edible from it. The gentle current gradually took the mass away into the blue as we headed back to the surface.

Back onboard *Norseman* we told skipper Phil Bendle about what we had seen. Phil's reply that it didn't sound like anything he had ever seen or even heard of, got our interest going further. A week later our photographs came back and we sent copies to various people hoping to get some identification.

Wade Doak posted it on his website (www.wadedoak.com) which has covered many of the rare and spectacular finds Wade and others have discovered at the Poor Knights Islands. He rang to say cephalopod specialist, Dr Steve O'Shea, from NIWA had identified our UFO.

"It's the egg mass of a large pelagic squid," Wade told us, "maybe even the biggest of them all, the giant squid, *Architeuthis dux,*" the animal portrayed as battling with sperm whales deep in places like the Kaikoura Canyon, in the South Island of New Zealand."

This prompted our own research into squid eggs. The earliest research was undertaken by Prince Albert of Monaco in the 1890s. A sperm whale harpooned by whalers regurgitated several species of very large "octopuses and squids" which the Prince and his team recovered. Five new species were identified from that encounter.

Jacques Cousteau's "Octopus and Squid" published in the early 1970s provided some interesting comments. Cousteau had sighted a giant squid during a submersible dive and had noted "a group of clouds of a white substance" nearby. He put them down to traces of squid ink that glowed in the dark when the submersible's lights were turned off. On examination of photographs taken by the Edgerton flash camera he noted that some filaments were massed together, forming a loosely woven ball a yard wide. They resembled spider webs and from the minisub he described the scene "as though we had entered a dusty attic." He again called the sight "the remnants of ink clouds emitted by large squids."

An email from Dr Steve O'Shea confirmed that had a photographic record of what was possibly a first. Our six UFO images of the circular mass of filaments, floating in the water, perhaps less than three weeks old, gave rise to where the giant female squid lived. The deep water outside the Poor Knights Islands drops to depths in excess of 1000m, certainly deep enough for giant squids.

The largest known squid *Architeuthis dux* can grow to 20 metres long including the two large tentacles. The squids' eyes, as big as dinner plates, are the largest of any animal and are needed to hunt in the dim depths. The body makes up less than a third of the squids' length and they can weigh more than 750kg. You begin to think how an egg mass, with thousands of individuals less than 1mm, could grow so rapidly into the world's largest invertebrate. Giant squid, like most cephalopods only survive two or three years. Imagine the food the squid must consume and the rate of growth.

New Zealand Species

Leptochiton subantarcticus (Iredale & Hull, 1930)
(Fig. 8)

Mon. liv. Chitons 1: 160, fig. 73, map 29.

Thanks to the generosity of Mr B. Hazelwood, Ellerlie, New Zealand, who has donated two complete specimens from off Otago Heads to the collection of the RMNH, we are now able to describe and depict all valves, the girdle elements and the radula.

Description. Animal highly elevated, dorsal elevation c. 0.77, the back subcarinated. Head valve semicircular, posterior margin widely V-shaped, tegmentum sculptured with numerous radiating rows of minute granules, crossed by 5-6 relatively strong, concentrical growth lines. Intermediate valves almost semi-oval, the length more than half the width, front margin strongly convex, side margins little rounded, hind margin straight, apex inconspicuous, lateral areas scarcely raised, only vaguely defined, sculptured like head valve, the growth lines concentrically continuing over the central area, which is ornamented with many rows of small granules, the rows longitudinally oriented in the jugal part, becoming posteriorly converging and rather indistinct towards the sides. Tail valve slightly more than semicircular, decidedly less wide than head valve, the length somewhat more than half the width, front margin about straight, mucro postmedian when seen from above, not prominent, posterior slope straight, steep, antemucronal area sculptured like central areas, postmucronal area like head valve.

Girdle dorsally covered with very small, slightly elongate scales, truncated at the base, distally round-topped, 48 × 34 μm, with 7 fine, longitudinal ribs, interstices distinctly wider. Marginal spicules straight, slender, smooth, white, distally sharply pointed, 128 × 16 μm. Ventral side of girdle paved with close set transverse rows of weakly longitudinally grooved scales, excavated at the base, distally tapering to a blunt top, 60 × 32 μm.

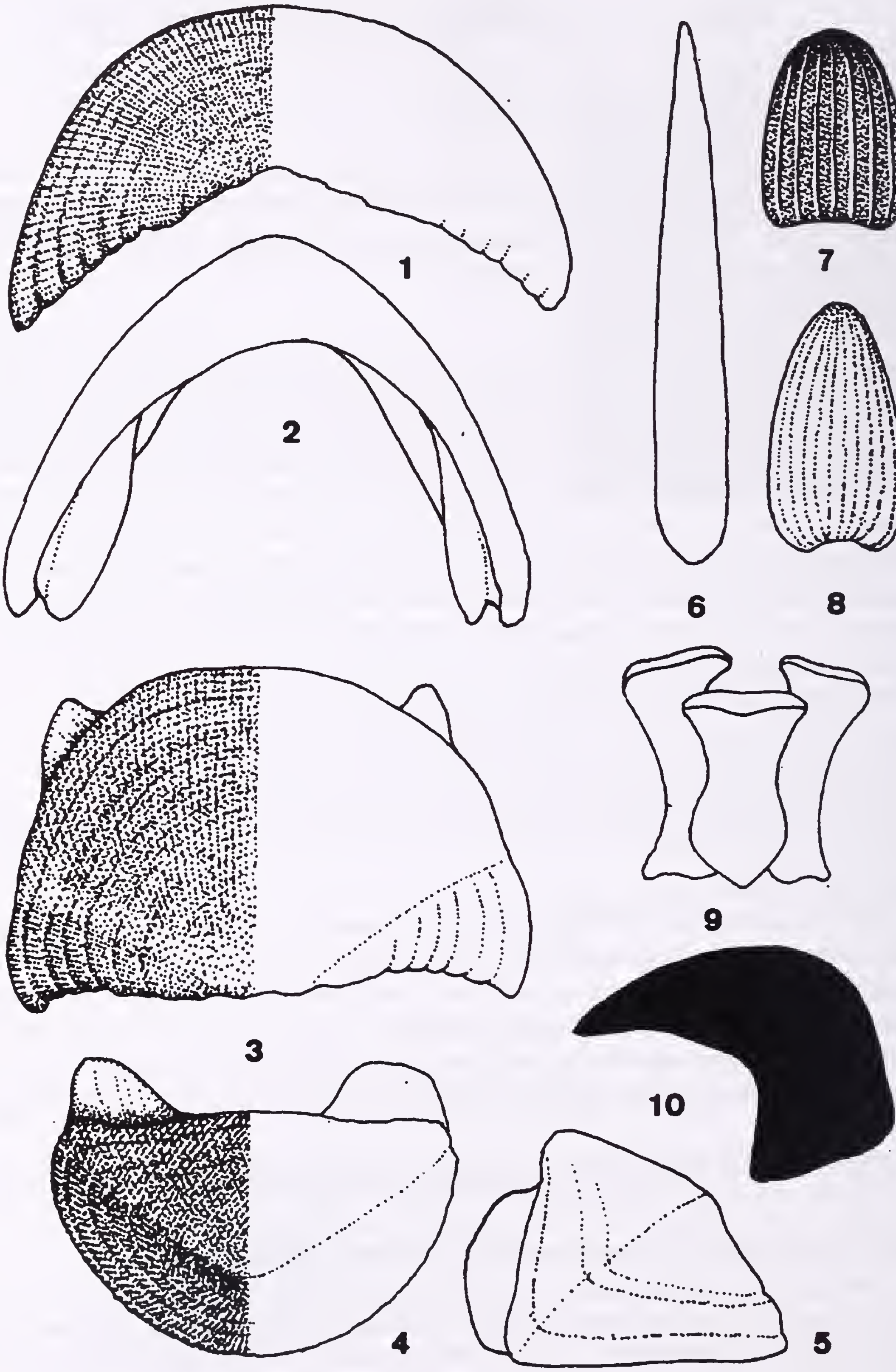
Central tooth of radula tulip-shaped, the base pointed, distal edge wide,

Fig. 8. *Leptochiton (L.) subantarcticus* (Iredale & Hull). ⟶

1, valve I, dorsal view, × 25; 2, valve IV, rostral view, × 25; 3, do, dorsal view, × 25; 4, valve VIII, dorsal view, × 25; 5, do, lateral view, × 25; 6, marginal needle, × 500; 7, dorsal girdle scale, × 500; 8, ventral scale, × 500; 9, central and first lateral radula teeth, × 500; 10, dental cap of major lateral tooth × 500.

1-10, specimen from New Zealand, Portobello, MBS sta. Mu 70-45, Papenui Canyon, off Otago Heads, 540-490 m, R.V. Munida, A.G. Beu leg., 22.X.1970, ex coll. B. Hazelwood, RMNH K5115.

with a weakly sinuose blade, first lateral tooth slightly longer, slender, outer lateral edge concave, antero-central corner somewhat inwardly produced with a narrow blade, major lateral with uncuspid head, the denticle strongly curved, pointed.



Acknowledgement
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Monograph of Living Chitons, Vol 5. Piet Kaas and Richard Van Belle

TWENTY YEARS AGO

By Nancy Smith

"Poirieria"Vol.11 part 2 was August, 1981. Vol.13 number 1 was August1983, So I guess Vol. 12 number 1 was 1982. There is no date on it. I was away in a camper van collecting shells all around Australia so do not have any idea what was happening here. It was the first year that "Poirieria" had only one issue. Sadly it has happened in recent years and I suppose the main cause is the same, not enough contributions in time for a second run. However Vol.12 was a good issue with 8 authors, but sadly half of them are now deceased. On the other hand, Noel Gardner and Beverley Elliot are still occasionally appearing in print, and Patricia Langford is joining in club activities again so maybe she will take up her pen again. We would like to hear from Derrick Crosby again too.

Thoughts were turning to conservation. The editorial by Derek Lamb mentioned it , and Lilian Witterick described developing a "home-rockpool" to save killing her finds. They had some interesting inhabitants of their tank ; one a 4 inch ribbon worm which was so shy it disappeared for 4 years and when it appeared again –"The length that one could actually see was about 14 inches and still the end was not visible." Invertebrates proved to be the easiest to keep and a protein skimmer the best piece of equipment.

Years ago walking on Ninety Mile Beach I was horrified to find hundreds-nay thousands of minute Toheroa spat lining the edges of the vehicle tracks presumably thrown out into the sun by fast moving vehicles. Ever since I have believed this to be a major cause of the disappearance of these precious molluscs from this beach. Now here was Norman Douglas singing the same song; decrying the fact that we had once again a closed season but still the beach was a designated road. This article is well worth reading again and thinking about

Derek Crosby recorded a trip led by Norman Douglas to hunt for "the elusive *Cucumerunio websteri*" in Lake Wahi. This band of explorers had considerable success in the "sticky, odiferous, oozy, black mud" Some years later a group of club members followed this trail, the same waterbirds observed, the same mud, but from memory, had little success, not even gathering many *Hyridella menziesi*. I do recall someone finding a nice artifact and a brave snorkeler meeting a large golden carp.

Beverley Elliot shelled at Pakawau , Easter 1982, (here's that elusive date confirmed) and had 3 great days after a gale on the Friday..The Wellington club joined her at Kaikoura for Queens birthday and the weather was awful. After the visitors left the washups started. But that's shelling eh? And remember this was El Nino time! Why did nobody write about the big washup at Pakiri that year, where some quite exciting things were found like *Columbarium. ?*

Maybe El Nino caused the great and unusual, for Algies Bay, washup of *Anomia trigonopsis* found by Bob Penniket. He says they were normally only an occasional solitary mollusc round the rocky shelves in the area, but this lot were reported to be ankle deep and stacked one on the other, clean bright shells with the dead animal inside.

Dave Gibbs and family spent a very stormy Easter in their caravan at Waihau Bay. They were all wet and cold when the power went off, and stayed off. On the Sunday they drove through Te Araroa township and found it devastated by the storm, trees and power lines down, roofs and verandahs torn off, two caravans overturned. In 1983 I found a beautiful *Balcis articulata* at Lottin Point and proudly proclaimed it a southern record, but David smuggly said "No, I found one that Easter!" It wasn't his only good find either.

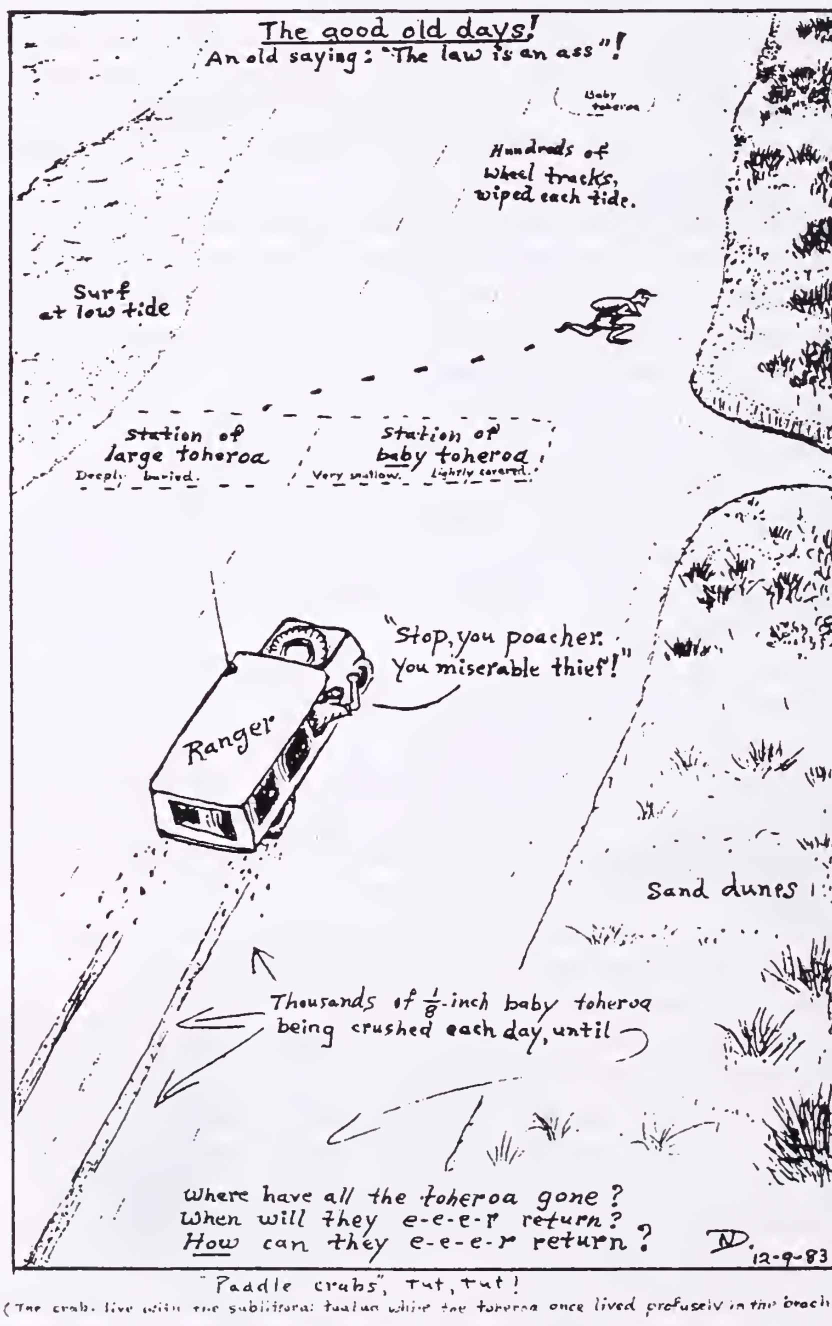
InJanuary of 1982 in windy weather ,after some rough seas, Patricia Langford and family were shelling on the Coromandel peninsula, not finding anything exciting until they fossicked in an old midden area on the sand dunes near Port Jackson. Here they found human bones and then a complete skeleton. They took home stones, shells, artefacts, a fossil moa toe, but only reported the bones to the ranger who said for many years the sight had been picked over by locals, visitors and archeological expeditions. The remains were believed to be some of the many Maori people who died in the great influenza epidemics, and were buried on the tip of the peninsula. Patricia checked out Takapuna, Orewa and Te Arai beaches after the August storms.

The Gardners had previously spent a month with a working party on Vanuatu and Noel gave an interesting report on that experience and a list of the more uncommon shells found on Tangoa Island.

It was reported that Richard Willan had edited a "Bibliography of Publications on New Zealand Mollusca (1973-1980)."

I came home at the end of the year laden with Australian shells but too late for the Bounty of El Nino. Well I hear there is another on the way! Good shelling all.

17.



"Paddle crabs", Tut, tut!

(The crabs live within the sublittoral zone while the toheroa once lived profusely in the beach)

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CONTENTS

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A VISIT TO LITTLE BARRIER ISLAND OR HAUTURU

Margaret Morley, Gladys Goulstone, Bruce Hazelwood, Betty Headford, Neville Hudson, Doug Snook, Glenys Stace, Fiona Thompson, Rosa and Richard Tyson

Several of the authors have dreamed of a trip to Little Barrier Island (Fig. 1) for many years. At last in October 2002 Rosa made the dream come true. She filled in permit forms, contacted the Department of Conservation to organise the boat trip and kept the ten Conchology Section members in touch with progress. We were booked into the bunkhouse for two nights.

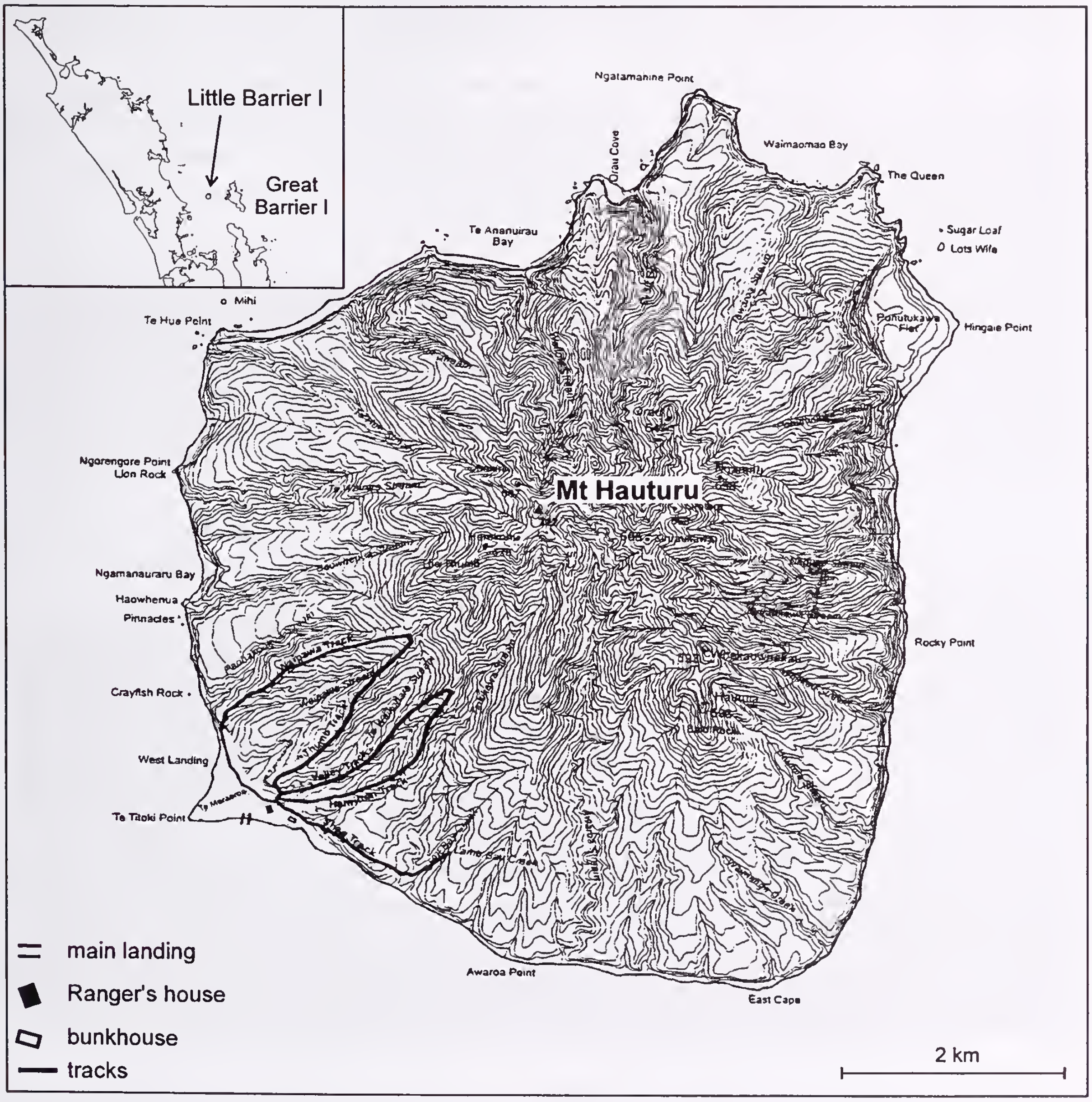

Fig. 1 Map of Little Barrier Island (Hauturu).

Bruce Hazelwood had a permit to collect land snails in leaf litter with assistance from Gladys Goulstone and Margaret Morley. The scientific results will be published in a report on Land Snails of Little Barrier at a future date. This will require much work.

The volcanic island is 80 km from Auckland. The Nature Reserve, now managed by the Department of Conservation, is mountainous and heavily forested except for a flat area at Te Maraeroa in the south west. This has been built up where two currents meet in the lee of prevailing storms. The coast is predominantly a mix of high steep cliffs and rounded boulder beaches.

We were warned to be ready to leap into waist deep surf to get ashore and double bag all gear in case of immersion, but amazing luck provided a totally calm day. Everyone left their homes early to be at Devonport by 8.30am. Luggage was loaded onto the 17 m MV "Hauturu". The Department of Conservation (DoC) boat is named after the Maori name of Little Barrier Island. It means "Resting place of the winds", because there is often a cloud cap over the summit of Mt. Hauturu, 722 m high. In the spacious cabin on board we were invited to made tea or coffee as required. First stop two hours later was at Tiritiri Matangi. While DoC landed gear, we were allowed 45 minutes to walk the tracks. In that short time we saw brown teal, North Island robins, red crowned parakeets, saddlebacks and at close quarters near the lighthouse, three bold takahe. Their gloriously coloured plumage was enhanced by the bright sunlight. From this view point the Hauraki Gulf looked magnificent. A highlight of the walk down was watching a bell bird drinking sugar water at a trough only arm's length away.

Off Kawau the skipper arranged a rendezvous with a small DoC boat to take on gear. The seas were so calm that the little blue penguins showed up very clearly in the water and you could even see their flipper action. Hauturu went through a large school of fish being bombarded by diving gannets and various petrels. We also enjoyed a pod of common dolphins who played for several minutes in the bow wave. Doug was delighted as he had not seen them before.

A light northerly breeze got up nearer Little Barrier about 3pm. The calm seas made landing on the boulder beach really easy. The ranger came out in his aluminium dinghy to ferry gear and passengers ashore. The tinny roars on the wave crest into a boat cradle on railway lines (Fig. 2). The bow is immediately secured, then the loaded dinghy is rapidly winched up to the shed. Not only were all our bags and food containers safely ashore but we also had dry feet! A small tractor pulls a trailer loaded with gear right to the door of the bunkhouse. The ranger explained that no one is permitted to walk on tracks alone.

The resident kaka checked us out taking delight in flying from behind to within a hair's breath of your head while screeching! A brown teal nests under the balcony. They both hung around hoping for food. The bunkhouse was first class with all necessities, including a sofa made of driftwood which Glenys Stace wanted to take home. You have to lock the ranch slider if everyone goes out because the kaka has learnt to open it! He then causes havoc inside and lets the kiore in too. The next day Glenys left her pack outside. The kaka unpacked it for her right down to the contents of the first aid and dined on her apricots! We did a bit of local exploring along tracks that start right by the bunkhouse until it was dark.

Bruce and his tramping companion Fiona Thompson collected from seven sites along the Valley Track. The bush was very dry and good leaf litter hard to find. This was especially true in the upper regions of the track which were dominated by *Olearia rani, Astelia*, rewarewa *Knightia excelsa* and the occasional juvenile kauri *Agatha australis*. They also collected at two sites on the track near the bunkhouse at Titoki Point. Doug and Bruce collected a third sample in the same area. Gladys Goulstone and Betty Headford collected a

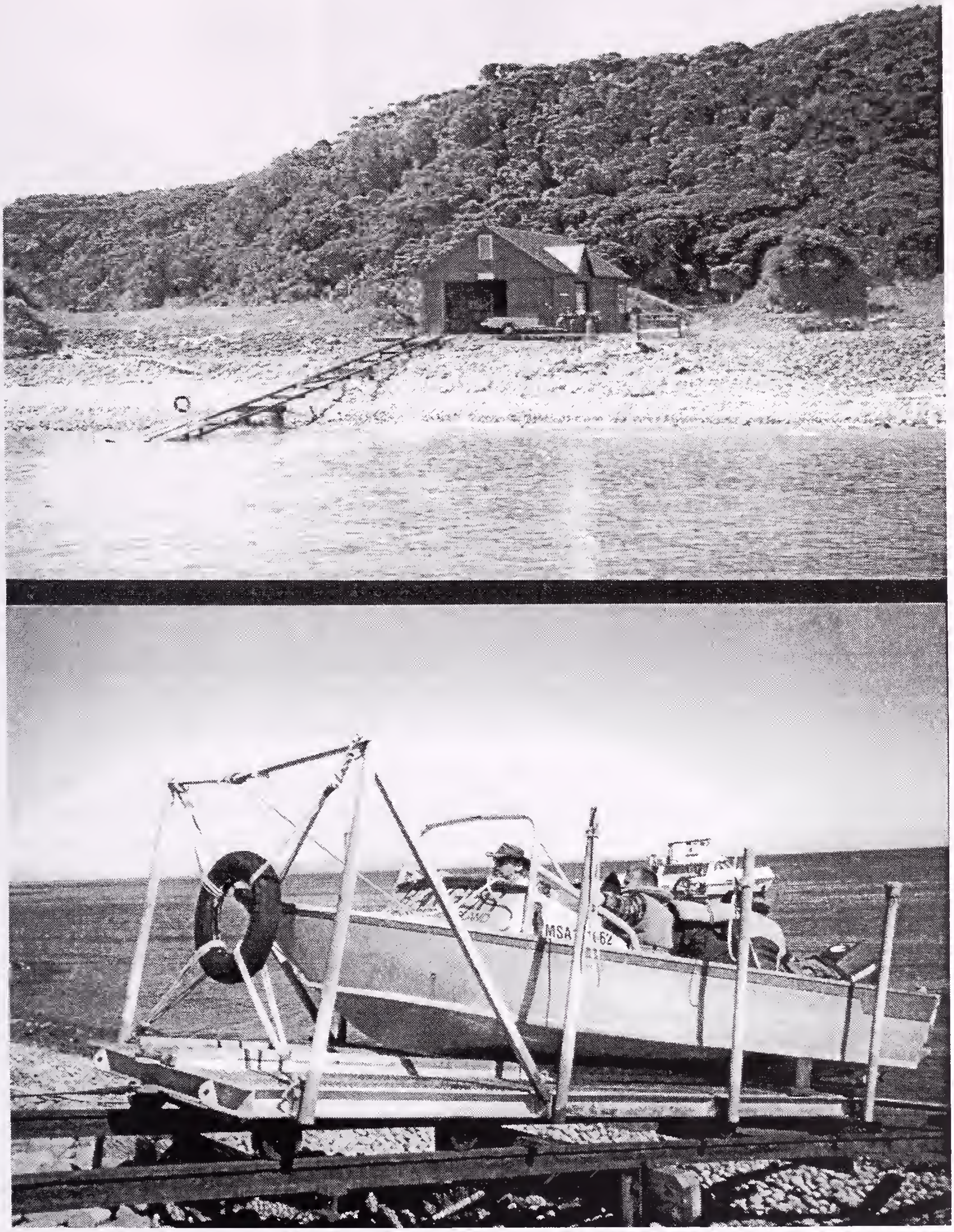

Fig. 2 Dinghy landing on the railway tracks. Winch shed and beach at Te Maraeroa Landing.

bag of leaf litter from the Hamilton Track and one from the Valley Track. Neville Hudson found a specimen of the introduced land snail *Oxychilus alliarius* under wood near the bunkhouse.

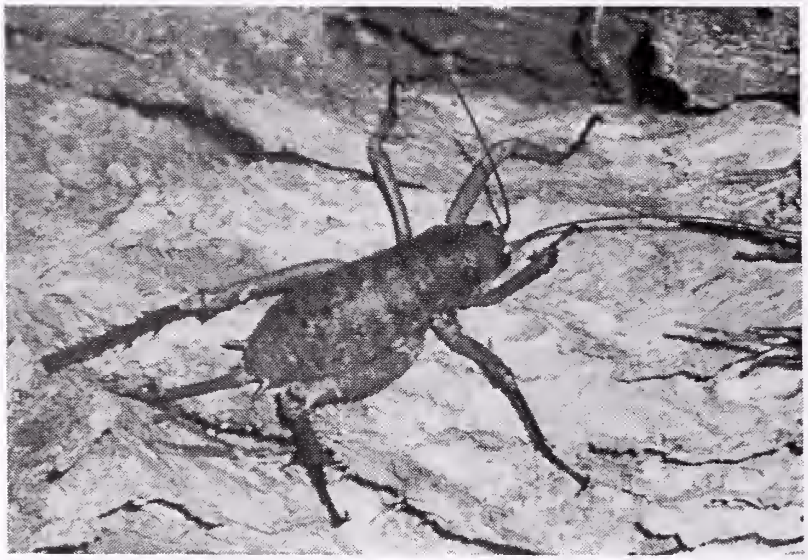

Fig. 3 Giant Weta. Photo Neville Hudson.

Collecting litter for land snails was done using a wire chip strainer to sieve out most of the coarse leaves, twigs and rocks. So even in poor areas, sieving large quantities of leaf litter and stones etc. produced at least a sample of fine litter from any given site. Gladys found a large dark flatworm with a white stripe along its back and the periphery punctuated by iridescent dots. At first we thought this was a slug.

Some species such as rangiora and kawakawa exhibit the island feature of having much bigger leaves than those on the mainland. The nikau are tall also with large leaves, reminiscent of those on the Kermadecs. Some were heavily in flower.

Encouraged by Neville we stared at the sky by the bunkhouse as the light faded, but not everyone saw a bat even though there are meant to be 20,000 of them! The giant weta hunt in the dark was no more successful despite all of us searching the old puriri tree where the ranger said five had been seen a month ago. Neville's perseverance paid off with a sight of a small female on a different tree during his second trip at midnight (Fig. 3). A kiwi was sighted and many moreporks were calling. After a sumptuous meal, a hot shower and much talk we retired to our bunks.

The following morning tui, bell birds, grey warblers and possibly a cuckoo sang as the light came up. Margaret climbed over boulders east of the main landing, hoping to find high tidal molluscs under the shade of a group of pohutukawa trees. Although many layers of stones were turned, sediment was lacking, the only result was bruised hands. The 'beach' is not inviting to marine life nor to people who want to go for a walk. It is more of a precarious balancing act as boulders tip just as you put your weight on them! Every level was a challenge, low tidal boulders were slippery, all levels were mobile and above high tide, boulders were treacherously hidden under the ground hugging shrub *Muehlenbeckia.*

At mid tide, abundant *Nerita atramentosa* were the only species to be seen. The low tide was only 0.9 m but a band of brown algae was visible just off the beach, probably *Carpophyllum maschalocarpum.* A few pieces of algae washed in, some of these only seen on exposed coasts. e.g. *Cystophora distenta, Spatoglossum chapmanii.* Storms had torn off algal holdfasts which washed in with other species still attached. These included the bivalves *Cardita aoteana, Hiatella arctica, Irus reflexus* and the pink barnacle *Balanus trigonus* (Fig.

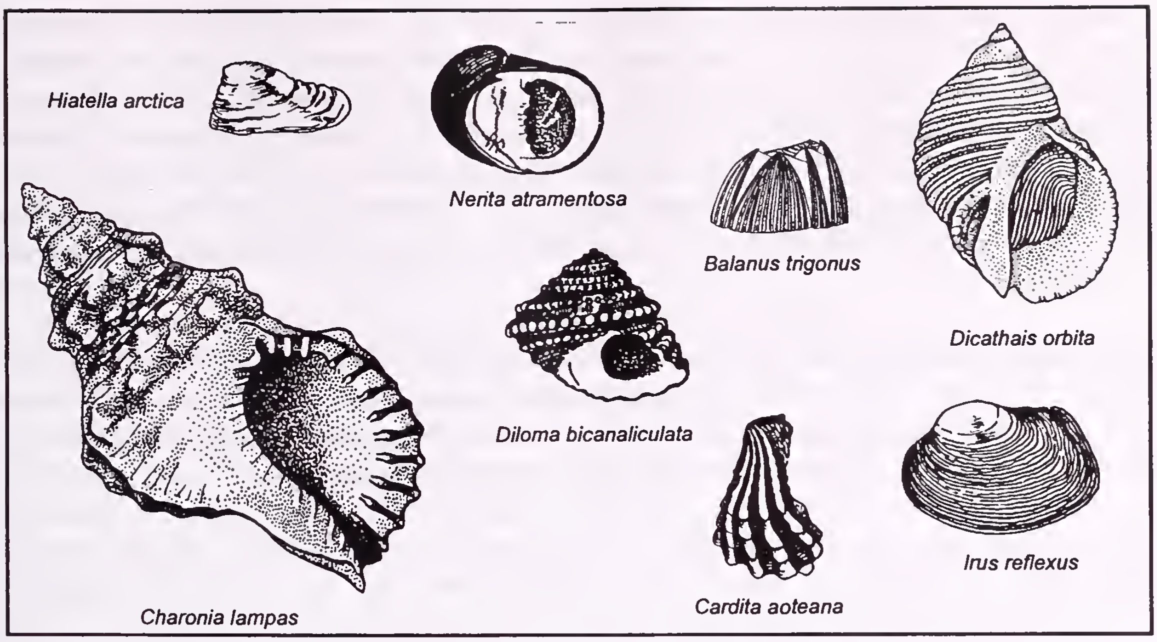

Fig. 4. Little Barrier molluscs. Drawings by A.W.B. Powell (1987) and Margaret Morley.

4, Species list). Pink *Corallina* paint covered the lower side of boulders at low tide. A green stunted turf of dark *Gigartina* sp. coated some boulders. *Haliotis* sp. have been recorded from middens. As progress was so difficult and slow there was no temptation to go further at beach level.

Most of the group climbed part way to the summit, up the steep Hamilton Track and back down the Valley Track. Betty Headford described this in her article (Headford 2003). A small peripatus was seen high on one of the ridges.

Glenys, Richard and Margaret walked across the Te Maraeroa flats. This area was previously a pa site, gardens and cattle paddocks. The cattle have been removed allowing ferns and scrub to regenerate. Flocks of bush pigeons feed in these open spaces. It seemed unusual to see them on the ground. A flock of endangered whiteheads chittered in the trees. Photographs were taken of the mass of white clematis blooms on a tree stump. We looked at the water bore and a 1910 grave of Hunter-Blair, a third son, surrounded by a white picket fence. At the start of the Waipawa Track orchids grew on the tree trunk bridge. We collected leaf litter for Bruce at two sites under nikau and below a very ancient puriri. The surf was pounding strongly on the western landing causing the boulders to growl.

After lunch Glenys, Fiona and Margaret walked the Shag Track to collect more leaf litter. There isn't much, so it takes a long time to get a good sample. Many saddlebacks were calling defending their territory. Wide fronds of green lichen decorated the kanuka trunks. Despite heavy rain no one retreated to the bunkhouse until dark. After sunset faces were well washed with rain while looking for bats, but positive sightings were rare.

Thursday morning Doug saw a kiwi and a kokako was seen, both near the bunkhouse. There was a hurried start as departure time was changed from 10 am to 8 am to minimise the effects of rising winds. We just had time to see the ranger's tuatara breeding programme which is the biggest in New Zealand. He has a nursery of three trays with recently hatched young, one baby fitted neatly onto his palm. Slightly older ones live in outdoor enclosures with bushes to encourage insects. Each has a burrow with double lids on top and a drainage tube exit. When they first started to breed them the newly hatched young died. Then it was discovered that to

thrive they need sunlight to obtain Vitamin D. The bushes have to be pruned enough to let the sun in, but the tuatara need some shade too. The largest pen had teenagers who were nine years about 25 cm long, one male had just started to come into breeding colours developing yellow on the legs and around the margins of the body. It is hoped to get consent to remove the kiore next winter though a few of the Ngati Wai are against it. If this plan goes ahead the tuatara will be released. They were quite docile when handled, even enjoying their tummies tickled, but can bite and do not readily let go. In warmer summer temperatures these reptiles are much more lively.

Down at the landing Hauturu was loaded very efficiently with barrels and three loads of us and gear. This was considerably lighter in weight because we had eaten a lot and left more behind for the three volunteers who were staying for two weeks. Rosa cooked so much delicious tea Wednesday night that we enough left over for them too!

Back on board, from a sunny spot aft of the wheelhouse, we watched gannets, sooty and Cook's petrels following the vessel. Sooty petrels breed high on Little Barrier, their main food is deep sea squid which are caught when they rise to the surface at night.

When returning to the cabin Margaret passed the wheelhouse and was surprised when the skipper handed over the wheel. He explained the depth sounder that continuously plots the sea floor, the radar and Global Positioning Satellite etc. This plots your course and those of nearby vessels predicting a collision! She steered for over an hour back to Tiritiri Matangi changing course as well as managing to avoid a yacht and a container ship. The skipper described the dredging they have done in the Miranda area, also off Te Matuku, Waiheke with National Institute of Water and Atmosphere. The bottom samples are picked and species identified. The east coast around Tiritiri Matangi is a major snapper nursery. He works only on the boat with his crew doing whatever trips the Department of Conservation need. For the two days we were on Little Barrier they were on Great Barrier Island doing training programmes for DoC staff.

Hauturu had to off load gear at Tiritiri Matangi giving us thirty minutes ashore. We walked along the coast viewing the little blue penguins in their nesting boxes. During the final sail to Devonport we saw several America Cup boats practising at close quarters.

We were all delighted with our amazing experiences and voted it a great trip. Rosa did it so well we hope more dreams will become a reality before too long.

Marine Species List
Gastropods
Dicathais orbita, Trochus viridus - on shelf in the bunkhouse.
Calliostoma tigris - recorded live off Ngatamahine point (Jenny and Tony Enderby 2002).
Charonia lampas - on shelf in the bunkhouse, also recorded live off Ngatamahine point (Jenny and Tony Enderby 2002).
Cookia sulcata - dead on beach.
Diloma bicanaliculata - washed in dead.
Haliotis sp. - recorded in middens.
Nodilittorina antipodum - sparse populations most less than 3 mm. Some live in vesicles in boulders.
Cellana radians - frequent on the sides of boulders near low tide.
Cellana ornata - none seen on the eastern side of Te Maraeroa, 3 specimens together with *Chaemosipho columna* - living on the shore side of mid tidal boulder on western side.

Nerita atramentosa - abundant and dominant mollusc on intertidal boulders both sides Te Maraeroa. Juvenile *Nerita* lined up in narrow rock crevices.

None of the following gastropods or crab were seen on this trip (these names have been updated). Gastropods *Diloma niggerima, Diloma zelandica, Lepsiella scobina, Marinula filholi* and the half crab *Petrolisthes elongatus* - recorded in an early book on *Little Barrier Island;* gastropod records in Milligan (1955) are *Atalacmea fragilis, Suterilla neozelanica, Notoacmea elongata* and *N. pileopsis.*

Bivalves

Teredo *Bankia* sp. - calcareous tubes were present in washed up logs.

Hiatella arctica, Cardita aoteana, Irus reflexus, Tawera spissa - dead in washed up holdfasts.

Tube worm *Spirobranchus cariniferus* - washed in dead.

Crustacea pink barnacle *Balanus trigonus* - dead in washed up holdfasts.

Echinoderm *Evechinus chloroticus* - dead on east side Te Maraeroa.

Polychaete worm *Spirorbis* sp. - on washed in algae fronds.

Lichen *Xanthoria* - occasional on rocks in splash zone, many other lichen species above high tide and in the bush.

Algae

Corallina paint - on boulders at low tide.

Gigartina sp. - green stunted turf on the sides of boulders.

Cystophora distenta, Carpophyllum maschalocarpum, Corallina officinalis, Spatoglossum chapmanii, Plocamium microcladioides, indet. red - washed in.

The main objective for this trip was to collect samples of leaf litter for land snails. This marine list is very incomplete being compiled from observations only during neap tides and due to the short time available. Many more species would be added if snorkeling and diving could have been included. A permit would be needed to collect algae and low tidal sediment to search for and identify microscopic molluscs.

Acknowledgements

Many thanks to the skipper and crew of the DoC MV "Hauturu" for transport to and from the island; to Little Barrier ranger Will Scarlet for boat and winch transport between MV "Hauturu" and the bunkhouse, many helpful suggestions and for showing us around the tuatara enclosures; also to Bruce Hayward for suggesting improvements, scanning the figures and formatting the article.

Bibliography

For readers interested in the geology, Maori and European history, eradication of predators and natural history the book *Little Barrier Island: New Zealand's Foremost Wildlife Sanctuary* by Ronald Cometti is highly recommended, his paintings and sketches beautifully illustrate the text.

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WORDS ON WHELKS.

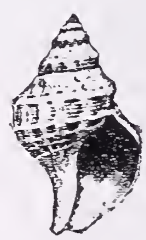
Michael K. Eagle

On a visit to England last year, I was treated to a seafood meal at a traditional restaurant in Kensington, London. Other than the many mouth-watering fish, lobster, and crab dishes were bivalve entrées such as oyster, mussel and scallop morneys and abalone chowders. However, additional to this was a traditional and obviously well loved delicacy, the humble buccinid gastropod, commonly called the whelk. Patrons gobbled the steamed morsels down with lashings of tartare sauce and chopped parsley. The Buccinidae are a large and diverse family (superfamily Muricoidea) of hundreds of species that live in cold polar to warm tropical seas. All species are carnivorous predators and scavengers, feeding predominantly on bivalves and sea urchins. The English species eaten is *Buccinum undatum* Linnaeus, 1758 that lives in the northwest-east Atlantic Ocean realm. Large quantities of the gastronomic delight are bought fresh from local fish markets and other foreign species are either purchased pickled or frozen. Fresh whelks prepared by chefs are washed, cooked and the meat extracted using a special tool similar to a cocktail fork. However, many of the imported species have either been commercially farmed in open ocean cages or "fished". These products have usually already had the shell crushed, meat extracted and eviscerated from the gut, and any impurities washed clean by automatic machinery. Whelks appear to be a major off-season fishery in both Europe and the east coast of North America, when fish and scampy trawling, long-liners, lobster, and crab fisheries close.

Whelk dishes have been served to patrons in New Zealand, but they are generally unknown as seafood, with their availability so far being either the result of farming trials or permitted attempts at harvesting in the wild. A large number of whelk species are found in the New Zealand marine environment, including common *Buccinulum* and *Penion* species, but only a few possess sufficient meat succulent and tender enough to be marketable. Commercial aquaculture trials have mainly involved the New Zealand "knobbed whelk" *Austrofusus glans* Röding, 1798 fished in relatively shallow water using a series of baited plastic containers attached to a long supporting strut (similar to methods used elsewhere in Europe). *Austrofusus glans* is a species that can be "fished" by the environmentally friendly method of potting. *Austrofusus glans* is distributed throughout New Zealand, including Stewart Island and the Chatham Islands from about low tide to about 400 metres (inner to outer continental shelf) on fine sand or silty muddy bottom. It is particularly abundant in 10 to 30 metres of water at many localities around the coast, and dead shells are often cast ashore. The species appears to be restricted to New Zealand where it has no seasonality, but is slow growing, perhaps deterring commercialisation. *Austrofusus glans* is a very common fossil from Late Nukamauran (?) geologic stage to Recent (c.2 million years to present). Having enjoyed the English variety, I am surprised that the humble New Zealand whelk is not available here.

Edible whelks: ***Buccinum undatum***

Austrofusus glans



A population of the sea slug, *Ercolania felina* (Hutton, 1882)
Margaret S. Morley

On 27 August 2003, I went to the little-visited Powell Bay, south of Maori Bay, Muriwai on Auckland's west coast (Fig. 1). Relatively easy access was gained via a track on private property. Although I had been invited to assist with marine studies of Auckland University of Technology students, I managed to fit in some observations of my own.

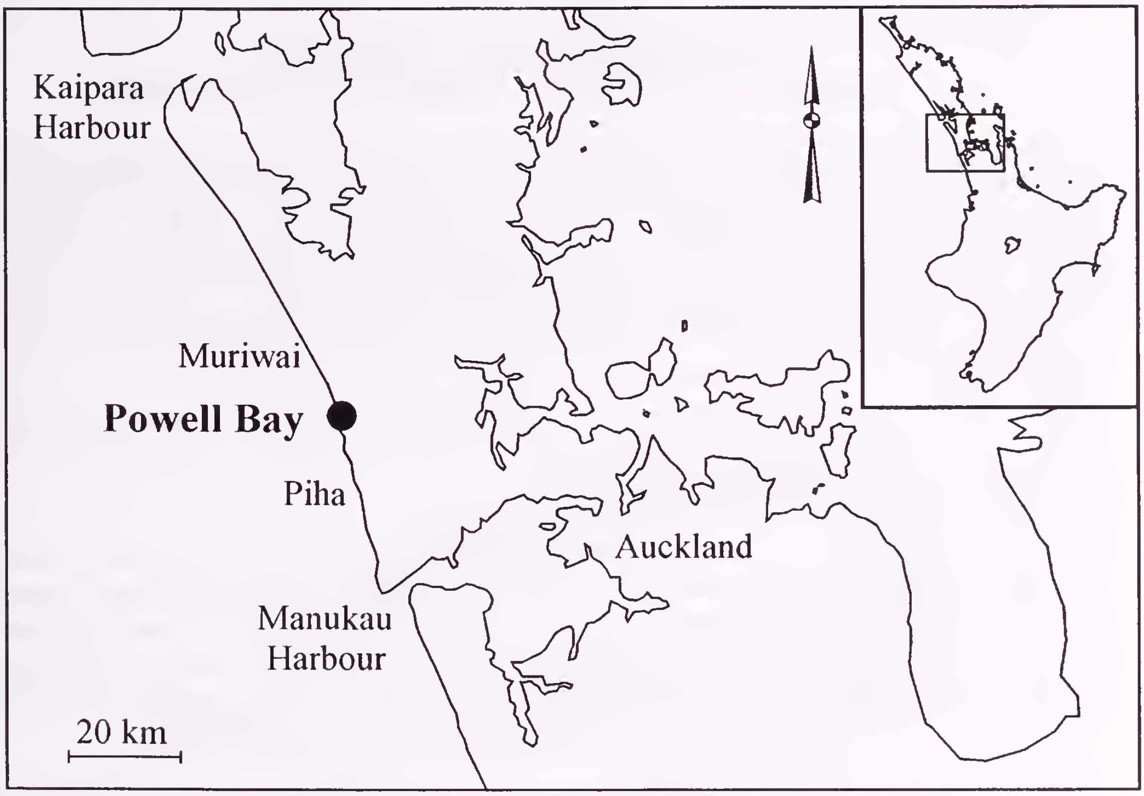


Fig. 1 Location of Powell Bay, Waitakere coast, Auckland.

Adjacent to the south end of this exposed beach is an extensive area of intertidal rock platform. When we visited, it was covered in a luxurious growth of the bright green seaweed, *Chaetomorpha aerea*. Strands under water stand upright and have a steely blue sheen, those out of water lie in long, tangled mats like newly washed hair. Each strand is made up of a single row of cells. It was especially abundant around the edges of shallow pools. To help identify this seaweed, bite the strands, if they crunch between your teeth, it is likely to be *Chaetomorpha aerea* because it contains silica.

During a short search among this expanse of green, I found several groups of the small sea slug, *Ercolania felina* (Fig. 2). This species was previously known as *Stiliger felinus*. The extended length of the largest specimen was 13 mm. The maximum length recorded is 10 mm (Willan and Morton 1984). One juvenile specimen was floating upside down on the water surface.

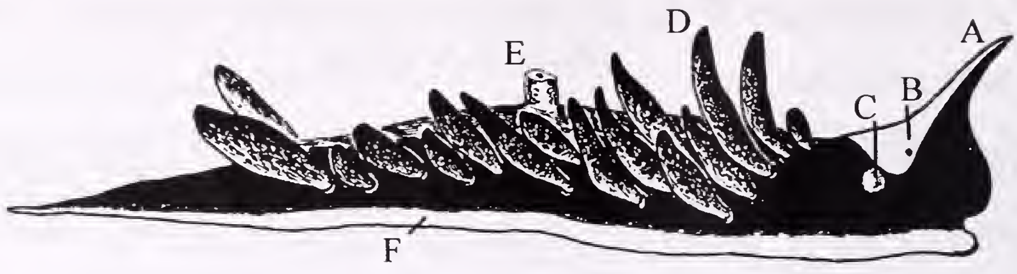


Fig. 2 Adult *Ercolania felina*. Length 13 mm.
A. rhinophores B. eye C. heart D. outgrowth E. anal tube F. foot

This species is a sacoglossan, which is one of the orders within the molluscan subclass Opisthobranchia. Sacoglossans exhibit a wide range of different features ranging from species with two shells and those with small, residual, external shells, to species like *Ercolania felina* with no shell at all. Most sacoglossans are herbivorous, their green or dark colour is derived from food pigments (Willan and Morton 1984). The radula has been modified, a single row of stiletto-like teeth are used to puncture the cellular wall of individual algal cells so that the fluid contents can be sucked out (Brusca 1990, p 732). The teeth are replaced with new ones as old ones get broken. The broken ones are not discarded but stored within the body (Walls 1982). I did not see specimens piercing the algal cells but they appeared to be grazing on the surface.

At a casual glance, all the *Ercolania felina* looked charcoal black, but careful comparison between specimens showed considerable variation, some were mostly dark, others quite pale or mottled with tannish grey. The lower margins of the foot were dotted with opaque grey or white. The tail was narrow and flat. The sole or underside of the foot was yellowish grey in the centre and paler grey towards the margins. A white line on the lateral side of the flat, triangular rhinopores expanded into a white patch around each small, black eye.

On each side of the body were club-shaped outgrowths set in diagonal rows, which seemed top heavy for the narrow body. The diagonal placement of the rows was more noticeable in those near the head. There are about 30 outgrowths on each side in the adult and ten in juveniles. These were irregular in size, i.e. there may be two large outgrowths near the centre of the body and two more near the tail, but uneven sizes in between. Even the outgrowths opposite each other did not match in size. Those on juveniles were more bulbous and club shaped than those of the adult (Fig. 2, 3).

Fig. 3 Dorsal view of juvenile *Ercolania felina*. Length 6 mm.

Under the microscope the outgrowths could be seen pulsating every 5-6 seconds. They are capable of independent pulsations and serve for respiration acting like gills (Richard Willan pers. comm.). The tail pulsated faster, about every 1-2 secs. The heart was visible as a small transparent, bulbous circle on the right side near the head. It could also be seen pulsating.

Each specimen had a central raised tube attached longitudinally along most of the dorsal surface. This is one of the main ducts of the digestive gland (Richard Willan pers. comm.). The anal tube projects from this and was located about one-third of the way behind the head in the adult and half way along the body in the juvenile.

Many tubular spawn coils laid by *Ercolania felina* were attached to the strands of *Chaetomorpha aerea* (Fig. 4). These were up to 5 mm long, each containing hundreds of pale, lemon-yellow eggs within a transparent jelly. The eggs were all of a uniform size, their colour tone blending perfectly with the bright green alga. The spawn had dark, striped, rod-like faecal strings attached over the outside, possibly to deter predators. After two weeks a dark spot developed within each egg, but no juveniles were seen to hatch.

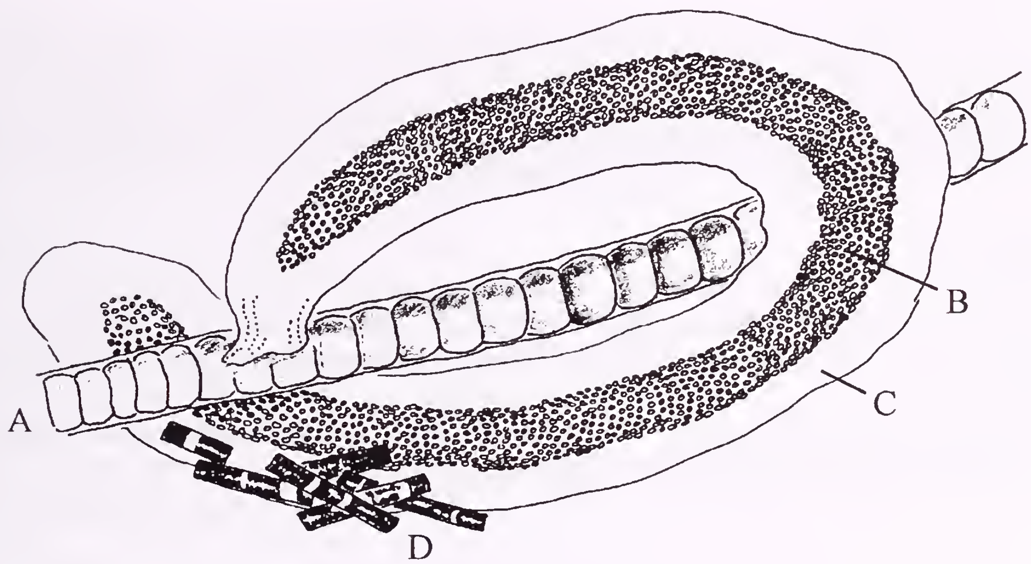


Fig. 4 Spawn coil of *Ercolania felina*. Length 5 mm.
A. a magnified strand of *Chaetomorpha aerea* showing individual cells B. eggs C. transparent jelly D. faeces attached to spawn coil

Discussion

It was delightful to watch the sea slugs crawl nimbly along and between the strands of *Chaetomorpha aerea,* which is their only habitat. Both the foot and the head have a central groove which allowed the foot to wrap around an individual strand of alga giving a doubly secure grip (Fig. 5). It seems likely that these are special adaptations for maintaining the animal's attachment to the strands, especially as at times they would experience heavy surf during high tide. A trail of mucus is secreted providing ease of movement and further adhesion.

Fig. 5 View from the front of *Ercolania felina* showing grooves on the head and foot.

Although many seaweeds have an annual growth cycle, this has not been determined for *Chaetomorpha aerea* (Ewen Cameron pers. comm.). It would be interesting to observe throughout a year to see if the breeding and high numbers of *Ercolania felina* coincide with a possible seasonal abundance of *Chaetomorpha aerea.*

Acknowledgements

Thanks to Andrea Alfaro (Auckland University of Technology) who organised transport and access to Powell Bay, Richard Willan (Museum and Art Gallery of Northern Territory, Darwin) for the *Ercolania felina* name update and information on structures seen, Ewen Cameron (Auckland War Memorial Museum) for information on *Chaetomorpha aerea* and to Clare Hayward (Geomarine Research) for formatting the article.

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INTERTIDAL BIOTA AND WASHUP AT AHIPARA AND HEREKINO, NORTHLAND WEST COAST

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SUMMARY

Three hundred and twenty-nine species are recorded from the Ahipara and Herekino Harbour shores of north-west Northland. These include 178 species of gastropods, 56 species of bivalves, 29 species of seaweeds, 14 species of crabs, 10 species each of chitons and barnacles, 9 species of echinoderms, 6 species each of anemones and polychaete worms. These records extend the recorded range of 12 mostly small gastropods. When the present observations are added to others from both coasts of northern New Zealand, we conclude that the boundary between the Cookian and Aupourian Marine Provinces would be better placed at the northern tip of Northland rather than near Ahipara.

INTRODUCTION

This study is one of several recently undertaken by the authors to document the poorly known diversity and biogeographic distribution of intertidal and shallow subtidal organisms along the west coast of the North Island of New Zealand. These are from north to south (Fig. 1):

1. Ahipara and Herekino Harbour (this study);
2. Whangape Harbour (Hayward et al., 1994);
3. Waimamaku Estuary (Hayward & Hollis, 1993);
4. Kawerua (Hayward, 1971, 1974, 1975, 1979, Hayward et al., 1995);
5. Waitakere Ranges (Hayward & Morley, in press);
6. Raglan Harbour area (Hayward et al., 2002);
7. Kawhia Harbour area (Morley et al., 1997);
8. Awakino to New Plymouth, north Taranaki (Hayward et al., 1999);
9. New Plymouth (Hayward & Morley, 2002).

<u>Previous studies</u>

We know of no previous study that documents the intertidal life of the Ahipara or Herekino Harbour coast. Powell (1927) recorded 51 species of molluscs and described five new species from a fish trawl from 42 m depth (23 fathoms) off Ahipara, and Morley (1995) recorded the first west coast occurrence of *Theora lubrica* from Herekino Harbour.

<u>Ahipara and Herekino Harbour</u>

Ahipara and Herekino Harbour (35° 10' S) are situated on the west coast of northern Northland, west of Kaitaia (Fig. 1). Ahipara, at the south end of Ninety Mile Beach, has a broad sandy beach (Shipwreck Bay) with considerable shelter from the prevailing swells provided by Tauroa Pt. The intertidal rocky shore on either side of Mokurau Beach is also relatively sheltered, but exposure increases towards Tauroa (Reef) Point. The wide intertidal rocky platform along the west coast south of Tauroa Pt is fully exposed to the ferocity of Tasman Sea swells and storms. 15 km south of Tauroa Pt is the 200 m-wide entrance to the 6 km long, 0.4-1 km wide Herekino Harbour, clearly a drowned former stream valley. The shore on the north side of the harbour is largely sandy, but the southern coast near the entrance

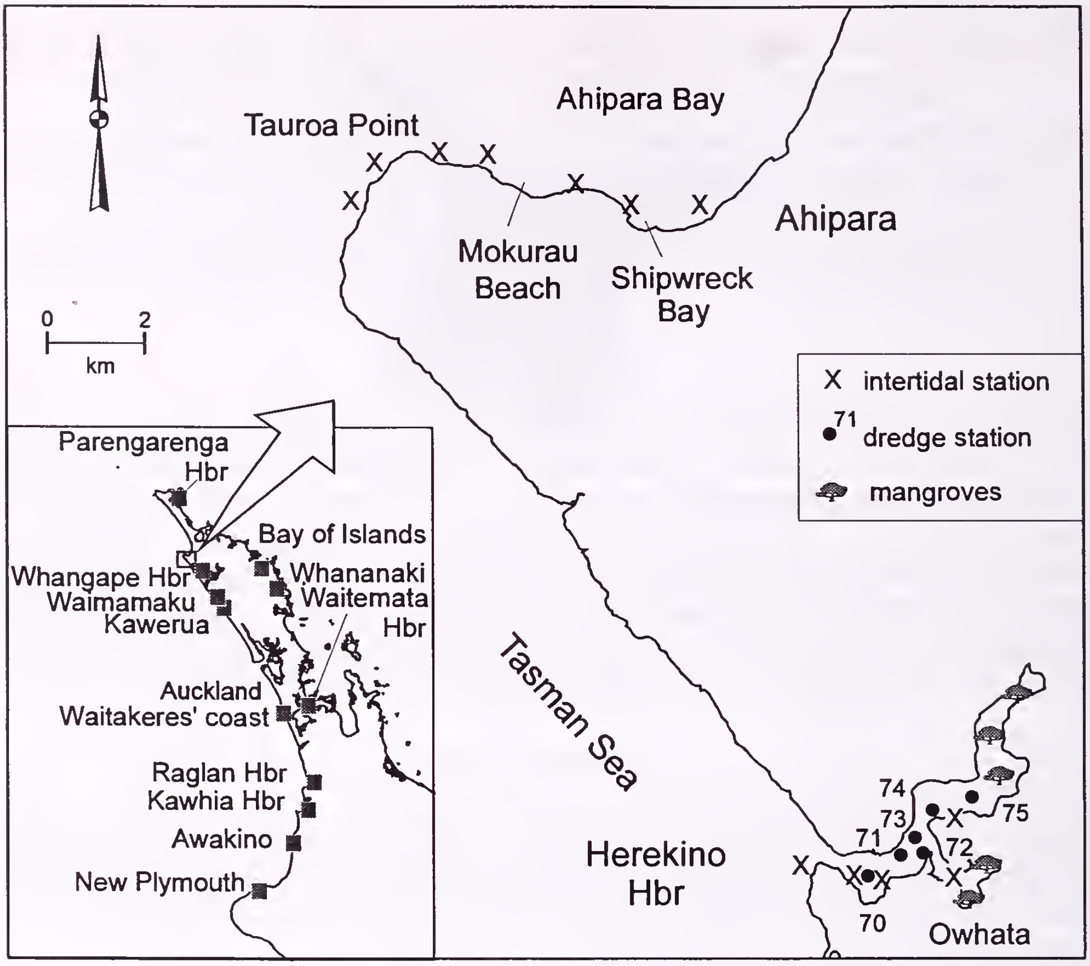

Fig. 1. Location of intertidal and dredge study sites at Ahipara and Herekino, west Northland.

consists of a relatively sheltered, rocky shore. The two branches of the upper harbour are largely composed of intertidal mud and sand flats surrounded by mangrove forest. At low tide the Hokianga Harbour is largely empty of water, with only a shallow subtidal entrance channel.

<u>Field work</u>

Field work was undertaken by all the authors (except MM and DR) during three days of spring low tide in April 1999. The results of these studies have been supplemented by observations made by MM.

SPECIES LIST

Mollusc nomenclature follows Spencer et al. (2002) and Marshall (2003).

Habitat where found:

A = Shipwreck & Mokurau Bch, washup
B = Shipwreck to Tauroa Pt, on rocks
C = south of Tauroa Pt, on rocks & washup
D = offshore, 40-45 m, dredged
E = Herekino Hbr, mangrove forest
F = Herekino Hbr, Owhata, rocks & sand
G = Herekino Hbr entrance, rocks
H = Herekino Hbr, dredged subtidal

Qualitative assessment of abundance:

a = abundant
c = common
f = frequent
o = occasional
r = rare
d = only seen dead
x = previous record
* = extension of range

	A	B	C	D	E	F	G	H
CHITONS								
Callochiton crocinus	.	.	d	.	.	.	.	.
Chiton glaucus	.	o	f	.	.	f	f	.
Cryptoconchus porosus	.	r	r	.	.	.	r	.
Eudoxochiton nobilis	.	r	.	.	.	.	r	.
Ischnochiton maorianus	.	f	f	.	.	r	o	.
Leptochiton inquinatus	.	o	.	.	.	.	.	.
Notoplax violacea	.	.	r	.	.	.	.	.
Plaxiphora caelata	.	d	r	.	.	.	.	.
Rhyssoplax stangeri	.	.	r	.	.	.	.	.
Sypharochiton pelliserpentis	.	c	f	.	r	f	c	.
GASTROPODS								
Acteon cratericulatus	.	.	.	x	.	.	.	.
Aeneator attenuatus	.	.	.	x	.	.	.	.
Alcithoe fissurata	.	.	.	x	.	.	.	.
Amalda australis	d	.	.	.	.	.	.	d
Amalda mucronata	d	.	.	.	.	.	.	.
Amalda novaezelandiae	.	.	.	.	.	.	.	.
Amphibola crenata	.	.	.	.	a	d	.	.
Amphithalamus falsestea	.	o	.	.	.	.	o	.
Anabathron hedleyi	.	c	c	.	.	.	.	.
Antimelatoma ahiparana	.	.	.	x	.	.	.	.
Antisolarium egenum	.	.	.	.	.	.	.	d
Aphelodoris luctuosa	.	.	x	.	.	.	.	.
Aplysia dactylomela	.	o	.	.	.	.	.	.
Asteracmea suteri	.	d	d	.	.	.	.	.
Austrofusus glans	d	.	d	.	.	.	d	.
Austrolittorina antipoda	.	a	c	.	.	f	f	.
Austrolittorina cincta	.	c	f	.	.	o	o	.
Austromitra rubiginosa	.	o	d	.	.	.	.	.
Hypermastus bulbula	.	.	.	x	.	.	.	.
Boreoscala zelebori	d	.	.	x	.	.	.	.
Bouchetriphora pallida	.	.	d	.	.	.	.	.
Brookula finlayi	.	.	.	.	.	.	.	.
Buccinulum linea	.	.	d	.	.	.	.	.
Buccinulum vittatum vittatum	.	d	d	.	.	.	o	.
Cabestana spengleri	.	o	d	.	.	.	.	.
Caecum digitulum	.	.	d	.	.	.	.	.
Calliostoma punctulatum	d	.	d	.	.	.	d	.
Cantharidella tesselata	.	c	c	.	.	.	c	f
Cantharidus purpureus	.	.	d	.	.	.	.	d
Cellana ornata	.	o	o	.	.	.	f	.
Cellana radians	.	c	f	.	.	f	c	.
Cerithiella stiria	.	.	d	.	.	.	.	.
Chemnitzia spp.	.	.	d	.	.	.	.	d
Cirsonella aff. laxa *	.	.	.	.	.	.	.	d
Cominella adspersa	d	.	.	.	.	o	.	.
Cominella glandiformis	.	.	.	.	o	f	d	f
Cominella maculosa	.	.	r	.	.	.	.	.
Cominella quoyana quoyana	.	.	d	.	.	.	.	.
Cominella virgata virgata	.	d	d	.	.	.	d	.
Cookia sulcata	.	.	o	.	.	.	.	.
Crepidula youngi	d	.	.	.	.	.	.	.
Crosseola vesca	.	.	d	.	.	.	.	.
Cuvierina columnella	.	.	.	x	.	.	.	.
Cylichna thetidis	.	.	.	x	.	.	.	.
Cymatium parthenopeum	.	o	.	.	.	.	o	.
Dentomargo amoena	.	.	.	x	.	.	.	.
Dentomargo cairoma	.	.	d	.	.	.	.	.
Dicathais orbita	.	c	o	.	.	.	f	.
Diloma bicanaliculata	.	.	r	.	.	.	.	.
Diloma coracina	.	.	d	.	.	.	.	.
Diloma subrostrata	.	d	d	.	c	f	.	d
Diloma zelandica	.	.	d	.	.	.	.	.
Doriopsis flabellifera	.	x	x	.	.	.	.	.
Eatoniella albocolumella	.	d	o	.	.	.	.	.
Eatoniella flammulata	.	d	d	.	.	.	.	.
Eatoniella limbata	.	o	.	.	.	.	.	.
Eatoniella mortoni	.	.	d	.	.	.	.	.
Eatoniella notalabia	.	d	.	.	.	.	.	.
Eatoniella olivacea	.	c	d	.	.	.	o	.
Eatoniella pfefferi	.	c	.	.	.	.	.	.
Eatoniella roseospira	.	.	d	.	.	.	.	.
Eatonina crassicarinata?	.	.	d	.	.	.	.	.
Eatonina subflavescens	.	.	o	.	.	.	.	.
Emarginula striatula	.	.	d	.	.	.	.	.
Epitonium bucknilli	.	.	.	x	.	.	.	.
Epitonium jukesianum	x	d	d	.	.	.	.	.
Epitonium minorum	.	.	.	x	.	.	.	.
Haliotis australis	.	.	r	.	.	.	d	.
Haliotis iris	d	.	d	.	.	.	d	.
Haliotis virginea	.	.	o	.	.	.	.	.
Haminoea zelandiae	.	.	d	.	.	.	.	.
Haustrum haustorium	.	o	f	.	.	.	o	.
Herpetopoma bella	.	.	d	.	.	.	.	.
Herpetopoma larochei *	.	.	d	.	.	.	.	.
Incisura lytteltonensis	x	.	.	.	.	.	.	.
Janthina exigua	.	.	d	.	.	.	.	.
Lamellaria ophione	.	.	d	.	.	.	o	.
Larochella alta *	.	.	d	.	.	.	.	.
Lepsiella scobina	.	a	f	.	.	.	f	.
Leuconopsis obsoleta	.	.	d	.	.	.	.	.
Linopyrga rugata rugata	.	.	d	.	.	.	.	.
Lodderena formosa	.	.	d	.	.	.	.	.
Lucerapex angustatus	.	.	.	x	.	.	.	.
Macrozafra subabnormis	.	.	d	.	.	.	.	.
Maoricrypta costata *	.	.	r	.	.	.	.	.
Maoricrypta monoxyla	.	o	o	.	.	.	r	.
Maoricolpus roseus manukauensis	d	r	.	.	.	.	.	.
Marinula filholi	.	.	d	.	.	.	.	.
Melagraphia aethiops	.	.	d	.	c	o	.	.
Merelina compacta *	.	.	d	.	.	.	.	.
Merelina lyalliana	.	.	d	.	.	.	.	d
Merelina taupoensis *	.	.	d	.	.	.	.	.
Mesoginella larochei	.	d	d	x	.	.	.	.
Mesoginella pygmaea	.	d	d	.	.	.	.	.
Micrelenchus huttonii	.	.	.	.	.	.	.	d
Micrelenchus sanguineus	.	.	d	.	.	.	o	r
Micrelenchus huttoni	d	.	.	.	.	.	.	.
Microvoluta marginata	.	.	.	x	.	.	.	.
Neoguraleus amoenus	.	.	d	.	.	.	.	.
Neoguraleus lyallensis	.	.	.	.	.	.	.	d
Neoguraleus murdochi	.	.	d	.	.	.	.	.
Nerita atramentosa	.	o	o	.	o	o	o	.
Notoacmea elongata	.	.	f	.	.	.	.	d
Notoacmea helmsi	.	.	.	.	f	f	.	d
Notoacmea parviconoidea	d	o	d	.	.	.	.	o
Notoacmea pileopsis pileopsis	.	f	d	.	.	.	.	.
Notoacmea helmsi f. scapha	.	.	d	.	.	.	.	.
Notoacmea scopulina	.	.	.	.	.	.	x	.
Notoacmea subtilis	.	.	d	.	.	.	.	.
Nozeba emarginata	.	.	.	.	.	.	.	d
Odostomia takapunaensis	.	d	d	.	.	.	.	.
Onchidella nigricans	.	.	.	.	r	.	.	.
Onoba fumata	.	.	d	.	.	.	.	.
Ophicardelus costellaris	.	.	.	.	f	.	.	.
Paratrophon cheesemani	.	o	.	.	.	.	.	.
Paratrophon quoyi	.	.	x	.	.	.	.	.
Patelloida corticata	.	o	o	.	.	.	o	.
Penion sulcatus	.	.	d	.	.	.	.	.
Pervicacia tristis	.	d	o	.	.	.	.	.
Phenatoma rosea	d	.	.	.	.	.	.	.
Pisinna rekohuana	.	d	.	.	.	.	.	.
Pisinna semiplicata *	.	.	d	.	.	.	.	.
Pisinna zosterophila	.	a	d	.	.	.	d	d
?Pleurobranchea maculata	.	.	.	.	.	.	r	.
Potamopyrgus estuarinus	.	.	.	.	a	.	.	.
Proxiuber australe	.	.	d	.	.	.	.	d
Pupa kirki	.	.	.	x	.	x	.	.
Pusillina hamiltoni *	.	.	o	.	.	.	.	.
Radiacmea inconspicua	.	d	.	.	.	.	.	d
Ranella australasia	.	.	.	.	.	.	d	.
Retusa oruaensis	x	.	d	.	.	.	.	.
Risellopsis varia	.	d	o	.	.	.	.	.
Rissoella cystophora	.	.	o	.	.	.	.	.
Rissoella elongatospira *	.	.	o	.	.	.	.	.
Rissoella rissoaformis *	.	.	d	.	.	.	.	.
Rissoina chathamensis	.	d	d	.	.	.	.	.

	A	B	C	D	E	F	G	H
Rissoina zonata	.	.	d	.	.	.	.	.
Sagenotriphora ampulla	.	.	d	.	.	.	.	.
Scutus breviculus	.	o	f	.	.	.	o	.
Seila cincta	.	.	d	.	.	.	.	.
Semicassis pyrum	.	.	d	.	.	.	d	.
Serrata mustelina *	.	.	d	.	.	.	.	.
Sigapatella novaezelandiae	d	.	o	.	.	.	o	.
Siphonaria australis	d	d	d	.	.	.	.	.
Siphonaria propria	d	.	d	.	.	.	o	.
Splendrillia otagoensis *	.	.	.	x	.	.	.	.
Stephopoma rosea	.	o	d	.	.	.	.	.
?Striodostomia orewa	.	d	.	.	.	.	.	.
Struthiolaria papulosa	d	.	.	.	.	.	.	.
Syrnola crawfordi	.	.	.	x	.	.	.	.
Tanea zelandica	d	.	.	.	.	.	.	.
Taron dubius	.	o	d	.	.	.	o	.
Terelimella aupouria	.	.	.	x	.	.	.	.
Thoristella carmesina	.	.	d	.	.	.	.	.
Thoristella oppressa	.	.	o	.	.	.	.	.
Trimusculus conicus	.	.	d	.	.	.	d	.
Trivia merces	.	.	d	x	.	.	.	.
Trochus viridis	.	.	d	.	.	.	d	.
Tugali elegans	.	.	x	.	.	.	d	.
Tugali suteri	d	.	d	.	.	.	.	.
Turbo smaragdus	.	f	f	.	r	o	.	d
Uttleya ahiparana	.	.	.	x	.	.	.	.
Volvulella nesentus	.	.	.	x	.	.	.	.
Xymene traversi	.	d	f	.	.	.	c	.
Zaclys sarissa	.	.	d	.	.	.	.	.
Zalipais lissa	.	.	.	.	.	.	.	r
Zeacolpus ahiparanus	d	.	.	x	.	.	.	.
Zeacumantus lutulentus	.	.	.	.	.	f	.	c
Zeacumantus subcarinatus	.	a	f	.	.	.	f	d
Zebittium exile	.	.	x	.	.	.	.	.
Zegalerus tenuis	.	d	d	.	.	.	.	d
Zemitrella choava	.	.	d	.	.	.	o	.
Zemitrella fallax	.	.	d	.	.	.	.	.
Zemitrella laevirostris?	.	.	o	.	.	.	.	.
Zemitrella stephanophora	.	.	d	.	.	.	.	.
Zemitrella sp.	.	.	d	.	.	.	.	.
Zeradina odhneri	.	.	.	x	.	.	.	.
Zethalia zelandica	d	d	.	.	.	.	.	d
BIVALVES								
Acar sandersonae	.	.	x	.	.	.	.	.
Acar sociella	.	.	d	.	.	.	.	.
Anomia trigonopsis	.	r	.	.	.	.	r	.
Arthritica bifurca	.	.	.	.	.	.	.	d
Austrovenus stutchburyi	d	.	.	.	.	.	.	a
Bankia australis	.	.	.	.	f	.	.	.
Barbatia novaezelandiae	.	.	d	.	.	.	.	.
Barnea similis	d	.	.	.	.	.	.	.
Bassina yatei	d	.	.	.	.	.	.	.
?Benthocardiella obliquata	.	.	d	.	.	.	.	.
Borniola reniformis	.	.	d	.	.	.	.	.
Cardita aoteana	.	.	d	.	.	.	.	.
Crassostrea gigas	.	o	o	.	f	f	o	.
Divarilucina cumingii	d	.	.	.	.	.	.	.
Dosinia anus	d	.	.	.	.	.	.	.
Dosinia subrosea	d	.	.	.	.	.	.	.
Gari lineolata	d	.	.	.	.	.	.	.
Hiatella arctica	.	d	d	x	.	.	.	.
Irus reflexus	.	o	d	.	.	.	r	.
Lasaea hinemoa	.	.	d	.	.	.	.	.
Leptomya retiaria	d	.	.	.	.	.	.	.
Macomona liliana	.	.	d	.	d	.	d	c
Mactra murchisoni	d	.	.	.	.	.	.	.
Melliteryx parva	.	.	d	.	.	.	.	.
Modiolarca impacta	.	r	.	.	.	.	d	.
Modiolus areolatus	.	.	d	.	.	.	d	.
Moerella huttoni	.	.	.	x	.	.	.	.
Montacuta semiradiata neozelanica	.	.	d	.	.	.	.	.
Myadora striata	d	.	.	.	.	.	.	.
Myllita stowei	.	.	d	.	.	.	.	.
Myllitella vivens vivens	d	.	x	.	.	.	.	.
Neolepton antipodum	.	d	o	.	.	.	.	.
Nucula hartvigiana	.	.	d	.	.	.	.	c
Nucula nitidula	.	.	d	.	.	.	.	.
Panopea zelandica	d	.	.	.	.	.	.	.
Paphies australis	.	.	d	.	.	c	d	a
Paphies subtriangulata	d	.	d	.	.	.	d	.
Paphies ventricosa	d	.	.	.	.	.	.	.
Perna canaliculus	.	a	o	.	.	.	o	.
Peronaea gaimardi	d	.	.	.	.	.	.	.
Philobrya munita	.	.	d	.	.	.	.	.
Protothaca crassicosta	d	d	d	.	.	.	d	.
Pseudoarcopagia disculus	x	.	d	.	.	.	.	.
Resania lanceolata	d	.	.	.	.	.	.	.
Ruditapes largillierti	x	d	.	.	.	.	.	.
Saccella bellula	x	.	.	.	.	.	.	.
Scalpomactra scalpellum	.	d	.	.	.	.	.	.
Soletellina nitidula	d	.	.	.	.	.	.	.
Spisula aequilatera	d	.	d	.	.	.	d	.
Talochlamys zelandiae	.	.	d	.	.	.	r	.
Tawera spissa	d	.	.	.	.	.	.	.
Theora lubrica	.	.	.	.	.	x	.	.
Trichomusculus barbatus	.	.	d	.	.	.	.	.
Xenostrobus pulex	d	a	a	.	r	.	a	d
Zenatia acinaces	d	.	.	.	.	.	.	.
SCAPHOPODS								
Antalis nana	.	.	d	x	.	.	.	.
CEPHALOPODS								
Argonauta argo	.	.	d	.	.	.	.	.
Spirula spirula	d	.	d	.	.	.	.	.
ECHINODERMS								
Allostichaster polyplax	.	.	r	.	.	.	.	.
Astropecten polyacanthus	r	.	.	.	.	.	.	.
Coscinasterias muricata	.	o	o	.	.	.	.	.
Echinocardium caudatum	.	.	.	.	.	.	.	.
Evechinus chloroticus	.	o	o	.	.	.	r	.
Fellaster zelandiae	.	.	.	.	.	d	.	o
Ophionereis fasciata	.	r	.	.	.	.	r	.
Patiriella regularis	.	o	f	.	.	.	o	.
Stichaster australis	.	o	r	.	.	.	r	.
CRABS								
Cyclograpsus lavauxi	.	.	.	.	f	f	.	.
Halicarcinus whitei	.	.	.	.	.	x	.	.
Helice crassa	.	.	.	.	c	.	.	.
Hemigrapsus crenulatus	.	.	.	.	f	.	.	.
Hemigrapsus edwardsi	.	.	r	.	.	o	o	.
Heterozius rotundifrons	.	.	.	.	.	.	r	.
Leptograpsus variegatus	.	f	r	.	.	.	o	.
Macropthalmus hirtipes	.	.	.	.	f	.	.	.
Notomithrax ursus	x	.	.	.	.	.	.	.
Ovalipes catharus	.	.	.	.	.	d	.	.
Ozius truncatus	.	f	f	.	.	.	o	.
Pagurus novizelandiae	.	c	f	.	.	o	f	.
Petrolisthes elongatus	.	f	f	.	.	o	f	.
Plagusia chabrus	.	f	o	.	.	.	.	.
BARNACLES								
Austrominius modestus	.	r	.	.	c	o	.	c
Balanus variegatus	.	.	d	.	.	.	.	.
Calantica spinosa	.	r	d	.	.	.	.	.
Chamaesipho brunnea	.	a	f	.	.	.	c	.
Chamaesipho columna	.	a	a	.	.	.	a	.
Epopella plicata	.	c	f	.	.	.	o	.
Lepas sp.	.	.	d	.	.	.	.	.
Notomegabalanus decorus	.	d	d	.	.	.	r	.
Platylepas hexastylos	x	.	.	.	.	.	.	.
Tetraclitella depressa	.	o	o	.	.	.	.	.
COELENTERATES								
Actinothoe albocincta	.	o	.	.	.	.	o	.
Amphisbetia bispinosa	d	.	d	.	.	.	.	.
Anthopleura aureoradiata	.	.	.	.	.	.	.	c
Diadumene neozelanica	.	.	r	.	.	.	.	.
Isactinia olivacea	.	c	o	.	.	r	o	.
Isocradactis magna	.	f	r	.	.	.	o	.
Isoparactis ferax	.	.	.	.	.	.	r	.
POLYCHAETES								
Flabelligera bicolor	.	o	o	.	.	.	.	.
Neosabellaria kaiparaensis	.	.	f	.	.	.	.	.
Pectinaria australis	.	.	.	.	.	.	d	.
Salmacina australis	.	o	o	.	.	.	.	.

	A	B	C	D	E	F	G	H
Spirorbis sp.	.	f	f	.	.	.	.	.
Spirobranchus cariniferus	.	c	a	.	.	c	c	.
PLATYHELMINTHES	.	r	r	.	.	.	.	.
SPONGES								
Tethya aurantium	.	o	.	.	.	.	.	.
ASCIDIANS	.	.	.	.	.	.	.	.
Corella eumyota	.	.	.	.	.	.	o	.
Pyura sp.	.	.	o	.	.	.	o	.
SEAWEEDS								
Apophlaea sinclairii	.	.	c	.	.	.	f	.
Carpophyllum maschalocarpum	.	o	o	.	.	.	o	.
Cheilosporum sagittatum	.	.	o	.	.	.	.	.
?Cladophora sp.	.	o	.	.	.	.	.	.
Codium convolutum	.	r	r	.	.	.	o	.
Codium dimorphum?	.	.	o	.	.	.	.	.
Codium fragile	.	.	.	.	.	.	o	.
Colpomenia sinuosa	.	.	.	.	.	.	o	.
Corallina officinalis	.	c	c	.	.	.	c	.
Durvillaea antarctica	d	r	r	.	.	.	.	.
Ecklonia radiata	.	o	o	.	.	.	o	.
Endarachne binghamiae	.	o	.	.	.	.	o	.
Gigartina alveata	.	.	.	.	.	.	f	.
Halopteris virgata	.	o	o	.	.	.	.	.
Hormosira banksii	.	o	f	.	.	.	o	.
Landsburgia quercifolia	.	o	o	.	.	.	.	.
Laurencia thyrsifera	.	.	o	.	.	.	.	.
Lessonia variegata	.	o	.	.	.	.	.	.
Melanthalia abscissa	.	o	o	.	.	.	o	.
Osmundaria colensoi	.	f	.	.	.	.	o	.
Plocamium costatum	.	o	.	.	.	.	o	.
Pterocladia capillacea	.	.	o	.	.	.	o	.
Pterocladia lucida	.	.	o	.	.	.	o	.
?Rivularia sp.	.	.	o	.	.	.	.	.
Scytothamnus australis	.	o	o	.	.	.	o	.
Splachnidium rugosum	.	.	.	.	.	.	o	.
Ulva lactuca	.	o	.	.	.	.	.	.
Ulva sp.	.	.	.	.	.	.	o	.
Xiphophora chondrophylla	.	o	o	.	.	.	f	.
INTERTIDAL LICHENS								
Lichina confinis	.	.	.	.	.	.	r	.
INTERTIDAL VASCULAR PLANTS								
Avicennia marina var. australasica	.	.	.	.	a	.	.	.
Zostera muellerii	.	.	r	.	.	.	.	.

HABITAT NOTES

Herekino Harbour

The mid to high tidal mangrove forest that fills the upper reaches of both arms of Herekino Harbour supports the usual range of marine invertebrates. Most common invertebrates are the mud snail *Amphibola crenata*, topshells *Melagraphia aethiops* and *Diloma subrostrata*, and mud crab *Helice crassa.* Commonly attached to the trunks, lower branches and aerial roots are the acorn barnacle *Austrominius modestus* and rarer Pacific oyster *Crassostrea gigas* and flea mussel *Xenostrobus pulex*, while algal grazers in the branches include rare *Nerita atramentosa, Turbo smaragdus, Onchidella nigricans,* and *Sypharochiton pelliserpentis.* Among rushes around the upper fringes of the mangroves are common *Potamopyrgus estuarinus* and less frequent *Ophicardellus costellaris.*

Thirteen invertebrate taxa were recorded living on and in the unvegetated fine to medium sand floor of Herekino Harbour and 20 more were present as dead shells (Appendix 1). Pipi *Paphies australis*, and cockle *Austrovenus stutchburyi*, are the dominant molluscs living both subtidally and intertidally (Fig. 2). The small sea anemone *Anthopleura aureoradiata*, are commonly attached to these two shallow-burrowing, infaunal bivalves, together with the acorn barnacle. Other common infaunal bivalves are the wedge shell *Macomona liliana*, nut shell *Nucula hartvigiana*, and occasional *Theora lubrica.* Common bivalves living on the sand surface are the horn shell *Zeacumantus lutulentus*, whelk *Cominella glandiformis*, and small topshell *Cantharidella tesselata.*

Ninety-two rock-inhabiting taxa (81 living) were recorded from on and under rocks along the southern shore of Herekino Harbour between the road end at Owhata and the harbour entrance (Fig. 1). Zone forming organisms on the rocky shore are the periwinkle *Austrolittorina antipoda*, barnacles *Chamaesipho brunnea* and *C. columna*, the flea mussel *Xenostrobus pulex*, tube worm *Spirobranchus cariniferus*, and the algae *Apophlaea sinclairii*, *Gigartina alveata, Xiphophora chondrophylla,* and *Corallina* turf. Common grazers on the rocky shore include the limpets *Cellana radiata* and *C. ornata*, and the small seaweed-inhabiting *Cantharidella tesselata*, and carnivores include the white rock shell *Dicathais orbita*, oyster borer *Lepsiella scobina*, smaller *Xymene traversi*, and occasional specimens of the large *Cymatium parthenopeum* (Fig. 2). Fifteen additional species of seaweed were also recorded on the rocks, especially around the low tidal fringe.

A rich fauna lives in the protection provided beneath low tidal cobbles, and includes numerous half crabs *Petrolisthes elongatus*, chitons *Chiton glaucus* and *Ischnochiton maorianus,* occasional gastropods *Buccinulum vittatum*, *Taron dubius*, soft-bodied *Scutus*

Fig. 2. Common intertidal and dredged species Herekino Harbour. Drawings by Powell (1987) and Margaret Morley.

breviculus, sea squirt *Corella eumyota*, crabs *Ozius truncatus* and *Hemigrapsus edwardsi*, and brittlestar *Ophionereis fasciata*.

Open coast beaches

Fifty-five species, mostly mollusc shells, were recorded washed up on the sand at the southern end of Ninety Mile Beach around Ahipara. Some of these are bivalves that live in the subtidal surf zone just offshore (e.g., *Bassina yatei, Dosinia anus, Mactra murchisoni, Paphies subtriangulata*, *Spisula aequilatera*); others have been washed in from deeper water during storms (e.g., *Amalda mucronata, Antalis nana, Austrofusus glans, Gari lineolata, Myadora boltoni, Resania lanceolata, Soletellina nitidula, Tanea zelandica, Zeacolpus ahiparanus*); some are pelagic (e.g., *Spirula spirula*); some are intertidal rock-inhabiting taxa (e.g., *Calliostoma punctulatum, Haliotis iris, Tugali suteri*); or have been carried by the tide out of

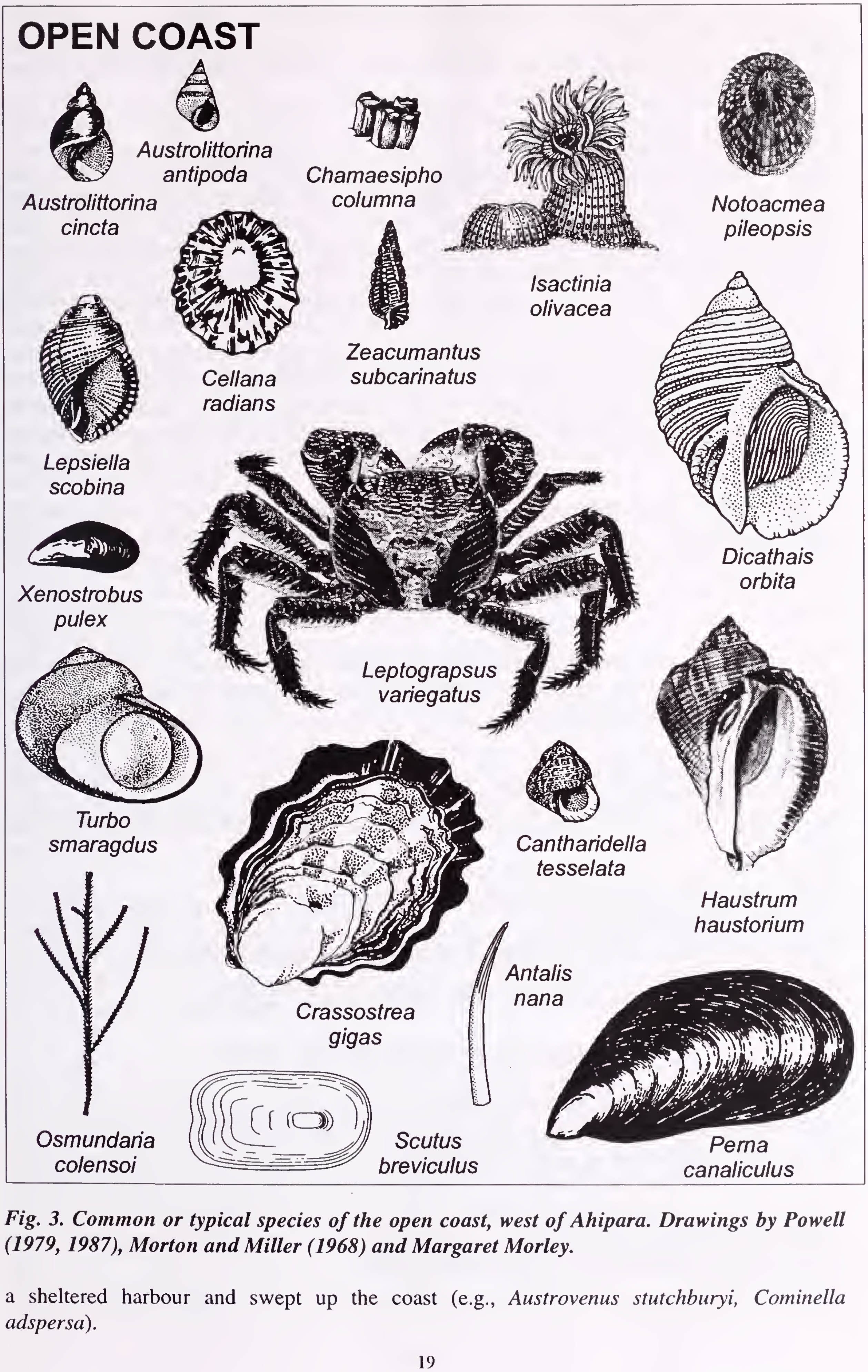

Fig. 3. Common or typical species of the open coast, west of Ahipara. Drawings by Powell (1979, 1987), Morton and Miller (1968) and Margaret Morley.

a sheltered harbour and swept up the coast (e.g., *Austrovenus stutchburyi, Cominella adspersa*).

During our visit, there was an unusually rich wash-up of 113 species on the high tidal beach above the low tidal reefs on the outside of Tauroa Pt. These included many of the rarer and unusual molluscs recorded in this study, most were derived from subtidal rock and sediment habitats.

Exposed rocky shore

One-hundred and ten species were recorded live on or under the intertidal rocks from Ahipara round to Tauroa Pt. Grazing on the rocks above high tide are common periwinkles *Austrolittorina antipoda* and *N. cincta*, and on more shaded faces the limpet *Notoacmea pileopsis* (Fig. 3). Slightly lower on the shore are the zoning barnacles *Chamaesipho brunnea*, *C. columna*, and *Epopella plicata*, their predator *Lepsiella scobina*, together with the red leathery seaweed *Apophlaea sinclairii*, and grazers *Cellana radiata* and *Sypharochiton pelliserpentis.* In shallow, mid to high tidal pools are common horn shells *Zeacumantus subcarinatus* and olive anemones *Isactinia olivacea*. Forming patchy zones around mid tide are the flea mussel *Xenostrobus pulex* and tube worm *Spirobranchus cariniferus*. Towards low tide the rocks have a carpet of pink coralline turf and in places dense beds of the green-lipped mussel *Perna canaliculus*, with their predators *Dicathais orbita, Haustrum haustorium*, and the orange starfish *Stichaster australis.* Common micromolluscs in the seaweeds include *Pisinna zosterophila, Cantharidella tesselata, Anabathron hedleyi, Eatoniella olivacea*, and *E. pfefferi.* The most common crabs are the red rock crab *Plagusia chabrus* at low tide, the purple intertidal crab *Leptograpsus variegatus*, the black-finger crab *Ozius truncatus*, and half-crab *Petrolisthes elongatus.*

TYPES

Eight species of gastropod were described by Powell from off Ahipara. Seven are still considered valid and the eighth is now considered to be a junior synonym of an earlier described species. These species are:

Off Ahipara 42 m

Aeneator attenuata Powell, 1927
Antimelatoma ahiparana Powell, 1942
Balcis pervegrandis Powell, 1940 = junior synonym of *Hypermastus bulbula* (Murdoch and Suter, 1906)
Finlayola crawfordi (Powell, 1927) as *Syrnola crawfordi*
Uttleya ahiparana (Powell, 1927) as *Rugobela ahiparana.*
Zeradina odhneri Powell, 1927
Zeacolpus ahiparanus (Powell, 1927) as *Turritella (Zeacolpus) ahiparana*

Off Ahipara, 140 m

Nodiscala ahiparana (Powell, 1930) as *Pliciscala (Nodiscala) ahiparana*

MOLLUSCAN BIOGEOGRAPHIC NOTES

The Ahipara and Herekino records of mollusc species extend the geographic ranges of 12 gastropods listed below (Fig. 4). Powell's (1979) published ranges have been used when commenting on extension of range, because Spencer and Willan (1996) give zoogeographic provinces only. These provinces (Powell 1979) are used to summarise the known ranges of each species (A = Aupourian, C = Cookian, F = Forsterian, M = Morioran, An = Antipodian). Additional records from the collections of the Auckland Museum (AK) and Margaret Morley (MM) are cited where they extend the published range.

* *Cirsonella* aff. *laxa* Powell, 1937, Skeneidae - previously recorded from depths of 260 m off the Three Kings, 90 m off the Snares Islands (Powell 1979), and 40 m off Pakiri, Northland (Morley et al. 1997b). The Herekino specimen (AK140828) is the first record from the west coast of the North Island. We have additional records from 90 m off Cape Maria van Diemen. These specimens show variation in the degree of separation of the body whorl and in details of ornamentation. There are 15 lots of *Cirsonella* in the Auckland Museum collections which are not identified to species level, they do not readily separate into the species described in Powell (1979). The Ahipara specimen is loosely coiled, the outer lip is strongly retractive to the suture and the umbilicus is about a third of the diameter of the base, all features of *C. laxa,* but it is smooth without the spiral chords and the body whorl is not completely separated from the aperture as described by Powell (1979). The range for *Cirsonella laxa* is now A and An provinces, including the east and west coasts of Northland.

* *Herpetopoma larochei* (Powell, 1926), Trochidae - previously recorded from the northeast of the North Island - Taupo Bay, Whangaroa, Great Barrier Island, Mayor Island (Powell 1979), Three Kings, and Whananaki, (AK), and at 1-15 m depth in the Bay of Islands (Morley and Hayward 1999). This Ahipara specimen washed up at Reef Point (AK 140599) is the first record from the west coast of the North Island.

* *Larochella alta* Powell, 1927, Aclididae - previously recorded from Mangonui, Awanui Heads, Rangaunu Bay, on the east coast of northern Northland, in depths of 10-20 m (Powell 1979). Also dredged from the Bay of Islands in 1-5 m (Morley and Hayward 1999). This specimen from Reef Point, Ahipara (AK 140601) is the first west coast record. The range is further extended by a specimen in anchor mud at 15 m depth in Dusky Sound, Fiordland (MM). The range for *Larochella alta* is now A, C and F provinces.

* *Maoricrypta costata* Sowerby, 1824, Calyptraeidae - previously recorded from Cape Maria van Diemen to Bay of Plenty (Powell 1979). Specimens from Reef Point, Ahipara (MM, AK) are the first west coast record. We also know of west coast North Island specimens from Waikawau and Kiritehere (MM) and the Waitakere coast (Hayward and Morley in press). The range is further extended by a specimen from Wharekauri, Chatham Islands (AK). The range for *Maoricrypta costata* is now updated to A, C and M provinces including the west coast of the North Island.

* *Merelina compacta* Powell, 1927, Rissoidae - previously recorded from off Mangonui, Northland in 10-20 m (Powell 1979), and known from Cape Maria van Diemen, Spirits Bay, and Rarawa, Northland; Poor Knights Islands in 40 m (MM) and Tryphena, Great Barrier Island (AK). These Ahipara specimens, washed up at Reef Point (AK140607), provide the first record from the west coast.

* *Merelina taupoensis* Powell, 1939, Rissoidae - this species is common in shell sand and under rocks at low tide on Northland's east coast from Cape Maria to Oneroa, Waiheke Island including Taupo Bay (Powell 1979), Colville (AK), and Great Barrier Island (MM). We have an additional record from algae wash at Sponge Bay, south of East Cape (MM). These Ahipara specimens (AK140610) provide the first west coast record. Thus the known range for *Merelina taupoensis* is now A and C provinces.

* *Pisinna semiplicata* (Powell, 1927), Anabathronidae - previously known from the northeast of the North Island, from Taupo Bay (Powell 1979) and the Bay of Islands (Morley and Hayward 1999). We have additional records from Spirits Bay; Great Barrier Island; Oneroa, Waiheke (MM); Tauranga; and Breaker Bay, Wellington (AK). The range for *Pisinna*

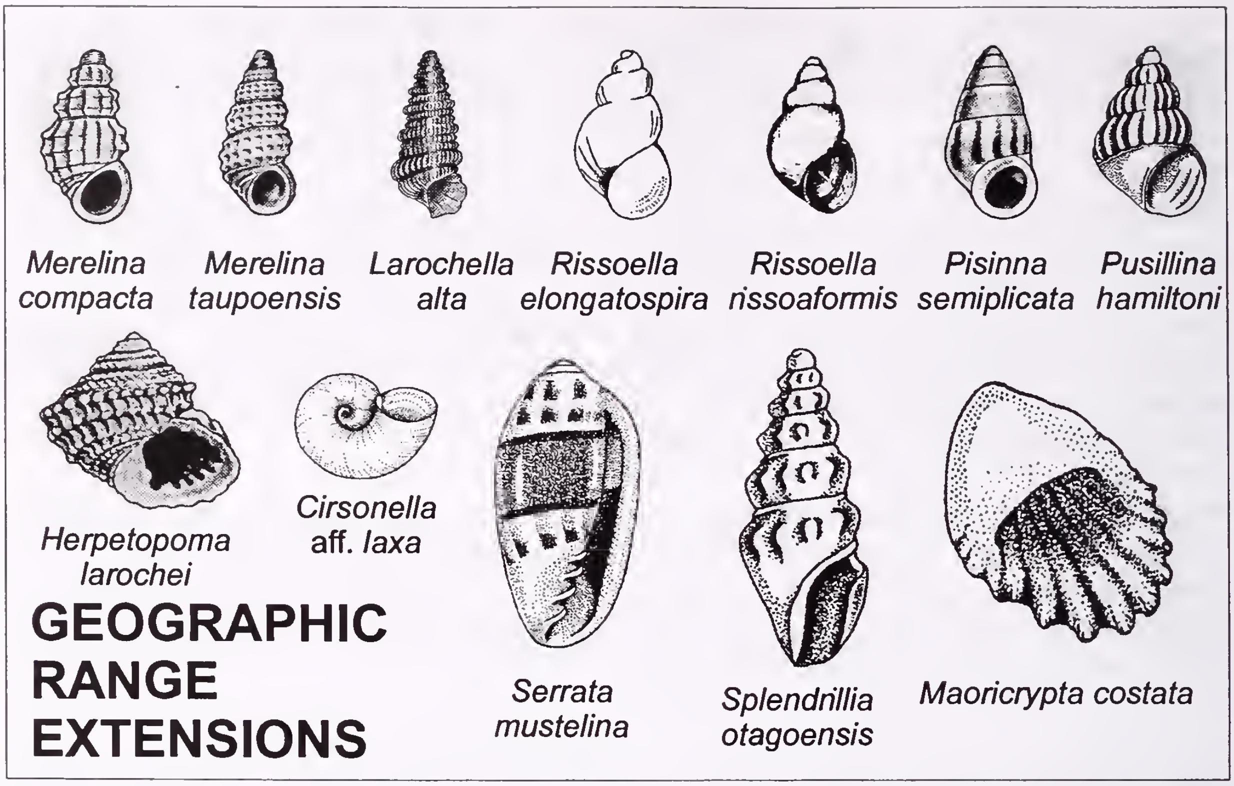

Fig. 4. Gastropods, whose recorded geographical range has been extended by this study. Drawings by Powell (1979, 1987) and Margaret Morley.

semiplicata is now updated to A and C provinces, including the west coast with this record from Reef Point, Ahipara.

* *Pusillina hamiltoni* (Suter, 1898), Rissoidae - previously known from Tom Bowling Bay, Northland; Hauraki Gulf; Lyall Bay, Wellington; Banks Peninsula; Foveaux Strait; Waitangi, Chatham Island (Powell 1979); and the Bay of Islands (Morley and Hayward 2001). There are also specimens collected from East Cape (AK). These Ahipara specimens living on algae (AK140616), provide the first west coast record. This species is known from A, C, F, and M provinces.

* *Rissoella elongatospira* Ponder, 1966, Rissoellidae - previously known from the east coast of the North Island; Wellington west coast; east coast of the South Island; Stewart Island and Chatham Islands (Powell 1979). The range is already recorded from A, C, F, and M provinces (Spencer and Willan 1996) and further updated to include An province (Morley 1996). This specimen from Reef Point, Ahipara (AK 140647) is the first west coast record in Northland.

* *Rissoella rissoaformis* (Powell, 1939), Rissoellidae - previously recorded from the east coast of the North and South Islands, plus Fiordland and Stewart Island (Powell 1979), but was only recorded from C and F provinces by Spencer and Willan (1996). The range for *Rissoella rissoaformis* was previously updated with specimens from Auckland and Snares Islands (Morley 1996). The Ahipara specimens from algal wash (AK140620) are the first west coast record from the North Island. The provinces for *Rissoella rissoaformis* are now updated to A, C, F, and An.

* *Serrata mustelina* (Angas, 1871), Marginellidae - previously recorded from Northland east coast down to East Cape (Powell 1979). We know of specimens from off Raoul, Kermadec Islands in 10-30 m (Brook pers. comm.) and Mahia Peninsula (AK). The Ahipara specimen

was collected at Reef Point. The range for *Serrata mustelina* is now A and C provinces, including the west coast of the North Island.

* *Splendrillia otagoensis* Powell, 1942, Drillidae - previously known from off Oamaru, Otago in 30 m; and Paterson Inlet, Stewart Island in 20 m (Powell 1979). The Ahipara specimen (AK81489) was identified by F. Wells, a turrid expert. He has also identified *S. otagoensis* from Whangaroa in 29-31 m; Deep Water Cove, Bay of Islands, in 55 m; Whangarei Heads in 7 m; off Mangonui, Doubtless Bay in 146 m; and off Mayor Island in 154 m (AK). F. Wells has retained *S. aoteana* as a valid species by identifying specimens from off Cuvier Island and off Little Barrier Island (AK). The range for *Splendrillia otagoensis* is now updated to A and F provinces. This is the first west coast record in the North Island.

BIOGEOGRAPHIC PROVINCES

Six shallow marine biogeographical provinces have been established for the New Zealand region (Powell, 1955): Kermadecian (Kermadec Islands), Aupourian (north-east North Island), Cookian (central New Zealand), Forsterian (southern South, Stewart and Snares Islands), Moriorian (Chatham Islands), and Antipodean (Subantarctic Islands). There are several definitions of a biogeographical province. It may be defined as an area that exhibits a marked percentage of endemism; or the boundary between provinces coincides with the distributional boundaries of a significant number of taxa, or where there is a marked changed in the dominant taxa. Some modern workers reject the concept of provinces, as they are clearly artifical human inventions that oversimplify and hide the real complex nature of biogeographical distribution patterns.

The relevance of biogeographical provinces to this Ahipara study lies in the fact that the western boundary between the Aupourian and Cookian Provinces was placed just north of Ahipara by Powell (1937), off Ahipara by Powell (1955), and between Ahipara and Kaipara by Spencer and Willan (1996). This boundary has presumably been placed off the west coast because of the presence of the weak southward-flowing, warm West Northland Current, which theoretically carries species southwards down the coast from the cape. Satellite imagery of water temperature suggests that the strength and distance it flows down the coast before meeting north-flowing currents is highly variable.

The distance south that the province boundary has been placed has presumably been influenced by the recorded occurrences of some largely east coast molluscan species along the northern end of Northland's west coast. Our study adds four, previously east coast-restricted mollusc species (*Herpetopoma larochei*, *Merelina compacta*, *M. taupoensis*, *Serrata mustelina*) to the small list that also occur as far south on the west coast as Ahipara. The total list with Ahipara as their southern limit is short, many have in recent years had their known ranges extended further south down the west coast by our studies, or even to the South Island.

If we examine the list of 728 molluscan species recorded in all our recent intertidal and shallow subtidal studies on both the east and west coasts of northern New Zealand, we find that we have recorded 463 (64%) from both east and west coasts, with a further 200 only recorded from the east coast (27%) and 65 only from the west coast (9%). Going around the top of North Cape Peninsula is where by far the greatest change occurs in the molluscan fauna and it could be argued that this is a more logical place for the Province boundary. In our study data going southwards down the west coast, Ahipara is the southern limit for 40 species, Kawerua for 22 species, the Waitakeres for 52 species, Raglan for 20 species, and Kawhia for 18 species.

Furthermore it could be argued that our intertidal and shallow subtidal records from Ahipara and Herekino have more in common with West Coast North Island (Cookian) than East Coast North Island (Aupourian) localities. The diversity of recorded molluscs from

Ahipara (238 species) is only slightly higher than that recorded from Kawerua (192, Hayward et al., 1995), the exposed Waitakere coastline (194, Hayward and Morley, in press), Raglan (192, Hayward et al., 2002), Kawhia (188, Morley et al., 1997a) and north Taranaki coast (197, Hayward et al., 1999), and considerably less than that recorded from similar sections of coast in the Aupourian, such as Whananaki (360, in prep.), Waiheke (340, MM), and even Mahia (334, in prep.). This confirms the observations that a larger proportion of the warm-water Aupourian "endemics" are restricted to the east coast than those that extend down the west coast, and thus it could be argued that the boundary might indeed be more naturally placed at the northern tip of the North Island.

Although many of the more common intertidal species are similar on both coasts, there are some clear differences, with the change occurring around North Cape area. For example, the bull kelp *Durvillaea antarctica*, the large orange starfish *Stichaster australis*, the colourful camouflaged anemone *Isocradactis magna*, and the gastropod *Paratrophon cheesemani*, are characteristic elements of all the exposed shores along the west coast (including Ahipara), but are all but absent from the East Coast. Dense intertidal beds of the green-lipped mussel *Perna canaliculus* are also a dominant zoning element on west coast shores, but they are far less abundant on the east. Two of the more common zoning organisms on east coast shores are the snail *Nerita atramentosa* and the brown seaweed *Xiphophora chondrophylla*, both of which are rare on the west coast with their highest west coast abundances in the north around Ahipara. Two other common molluscs on the east coast that are all but absent on the west are the slipper limpet *Maoricrypta costata* and *Venericardia purpurata*.

As the above discussion confirms, the province boundary is somewhat artificial and drawing it as a thin line hides the fact that the faunal changes are more gradual and spread over a broad zone, reflecting the complex and fluctuating physical oceanographic patterns and the differing tolerance limits and niche requirements of every species.

ACKNOWLEDGMENTS

We thank Jessica Hayward for drafting and F. Wells for identifying the *Splendrillia* species.

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Appendix I. Census data for 10 litre dredge samples taken inside Herekino Harbour

Dredge penetration averaged 0.1 m into the sea floor sediment. Live organisms are in numbers of individuals; presence of dead shells is indicated by d. See Fig. 1 for locations.

L261..	70	71	72	73	74	75
GASTROPODS	.	.	.	.	.	.
Amalda australis	.	.	.	*d*	.	.
Antisolarium egenum	.	.	.	*d*	.	.
Cantharidella tesselata	.	.	.	.	*11*	.
Cantharidus purpureus	.	.	.	.	*d*	.
Chemnitzia spp.	.	.	.	*d*	*d*	*d*
Cirsonella aff. *laxa*	.	.	.	.	*d*	.
Cominella glandiformis	.	*d*	*5*	*1*	*2*	*d*
Diloma subrostrata	.	.	.	*d*	*d*	*d*
Merelina lyalliana	.	.	.	.	*d*	.
Micrelenchus huttonii	.	.	.	.	*d*	*d*
Micrelenchus sanguineus sanguineus	.	.	.	.	.	*1*
Neoguraleus lyallensis	.	.	.	.	*d*	.
Notoacmea elongata	.	.	.	*d*	*d*	.
Notoacmea helmsi	*d*	*d*	.	.	.	*d*
Notoacmea parviconoidea	.	.	.	*d*	*1*	*d*
Nozeba emarginata	.	.	.	*d*	.	.
Pisinna zosterophila	.	.	.	.	*d*	*d*
Proxiuber australe	.	.	.	.	*d*	.
Radiacmea inconspicua	.	.	.	.	*d*	.

L261..	70	71	72	73	74	75
Turbo smaragdus	.	.	.	.	*d*	.
Zalipais lissa	.	.	.	.	.	*1*
Zeacumantus lutulentus	*4*	*d*	*1*	*d*	*3*	*d*
Zeacumantus subcarinatus	.	.	.	.	*d*	*d*
Zegalerus tenuis	.	.	.	*d*	.	.
Zethalia zelandica	.	.	.	.	*d*	*d*
BIVALVES	.	.	.	.	.	.
Arthritica bifurca	.	.	.	*d*	*d*	.
Austrovenus stutchburyi	*193*	*1*	.	*d*	*12*	*d*
Macomona liliana	*1*	.	*4*	*d*	*d*	*1*
Nucula hartvigiana	*3*	.	*1*	*d*	*1*	.
Paphies australis	*1*	*1.5*	*39*	*19*	*3*	*11*
Xenostrobus pulex	.	.	.	*d*	*d*	*d*
ECHINODERMS	.	.	.	.	.	.
Fellaster zelandiae	.	.	.	.	*2*	*d*
BARNACLES	.	.	.	.	.	.
Austrominius modestus	.	.	.	*6*	*3*	.
COELENTERATES	.	.	.	.	.	.
Anthopleura aureoradiata	.	*5*	*2*	*4*	*38*	.

Field trip to Orewa Beach Sun.18th May 03 by R. A.Tyson

Members: F. Thompson, Leader. J. & D. Snook, M. Bressolles, R A.Tyson

The afternoon was fine and overcast and a brisk northeast wind was blowing on shore. At 12-30 pm. we met at the southern end of the beach in the car park by the Orewa River. Low tide was at 1454 hrs. (Waitemata) After a leisurely lunch we set off along the sand bank at 1-15 pm to the place where the estuary debouches. We split up, leaving Michael intent on digging a meal of pipi, while Fiona and I walked on the three kilometre surf beach and Doug explored the southern rock shelf.

Orewa Beach is a popular holiday resort about 30 minutes drive north of Auckland City. On this Sunday afternoon the beach was crowded with people of all ages : folks out strolling, family groups with young children playing on the sand. Out on the water `surfies' skimmed across the waves on short boards towed by colourful billowing kites. At the northern end of the beach a fleet of wheeled `high-tec' sand yachts took advantage of the early afternoon low tide and raced over a improvised race track marked out on the firm sand with orange traffic cones.

Fiona walked out to the receding tide line looking for holes in the sand made by *Offadesma angasi,* but was unsuccessful, while I ambled along the strand line from the previous high tide looking for cast up shells (my preference for craft work).

The strand line dwindles out about half way along the beach where a line of large rocks are dumped on the sand to protect a section of low bank from erosion. Piles of crushed shell lay behind the rock barrier. At this point I walked out to the low tide line and reached the northern end of the beach by 3 pm. Wide rock ledges under the high cliffs were fully exposed and I couldn't resist a walk along the rock shelf to spy on the usual inhabitants of the many rock pools. I returned to my car about 4-30 pm. feeling pleasantly weary after my three hour walk.

<u>Species list sighted on the southern rock ledges by Doug Snook (S) and on the surf beach by Rosa Tyson (R) and Fiona Thompson (F)</u>

<u>Bivalves 17:</u>

Atrina zelandica (R) - horse mussel
Austrovenus stutchburyi (R) - common cockle
Barnea similis (S) - half shell only - angel wing rock borer
Dosinia anus (S&R) - biscuit coloured ringed dosinia
Dosinia lambata (S) - silky dosinia - thin shelled
Dosinia subrosea (S&R) - fine dosinia - whitish
rus elgans (S) - elegant venus shell - half shell only
rus reflexus (S)
Macomona lilliana (S&R)- large wedge shell
Mactra discors (S&R) - large trough shell
Paphies australis (S&R) - pipi
Paphies subtriangulata (S&R) - tuatua
Perna canaliculus (S&R)- green mussel
Peronaea gaimardi (S&R) - angled wedge shell
Protothaca crassicosta (S&R) - bivalve
Ruditapes largillierti (S&R) - oblong venus shell
Saccostrea glomerata (S&R) - Auckland rock oyster
Tucetona laticostata (R) - large dog cockle
Xenostrobus pulex (S&R) - small black mussel

<u>Gasstropods 23:</u>

Amalda australis (S&R) - olives (poor specimens)
Amphibola crenata (S&R) - mud snail
Austrofusus glans (R) - knobbled whelk
Buccinulum vittatum (S&R) - small lined whelk
Buccinulum linea (S) - lined whelk
Boreoscala zelebori (S) - wentletrap
Cellana radians (S) - limpet
Cominella adspersa (S&R) - speckled welk
Cominella glandiformis (S) - mud whelk
Cominella virgata (S) - red mouth
Dicathais orbita (S&R) - white rock shell
Diloma subrostrata (S&R) - top shell
Janthina janthina (S&F) - violet snail
Lepsiella scobina (S&R) - oyster borer
Maoricolpus roseus (S&R) - turret shell
Melagraphia aethiops (S&R) - dark top shell
Nerita atramentosa (S&R) - black nerita
Penion sulcata (R) - Northern siphon whelk
Struthiolaria papulosa (S&R) - large ostrich foot
Turbo smaragdus (S&R) - cats eye
Xymene plebeius (S) - common trophon
Zethalia zelandica (S&R) - wheel shell
Zeacolpus pagoda (S) - turret shell

Field trip to Little Omaha Bay and Whangateau Harbour 14th -15th. June 2003

by R.A.Tyson

Members: Glenys Stace Leader, Betty Headford, Heather Smith, Lyn Gumm and RosaTyson

Betty Headford made a significant find in the Whangateau Harbour of a specimen of the arrow headed squid, *Nototodarus sloanii* .The specimen is deposited in the marine collection of the Auckland War Memorial Museum.

Omaha beach resort North of Auckland is a popular family holiday destination and is situated on the expansive sand spit. The sand spit is bordered on the inland side by the muddy tidal beaches of the Whangateau Harbour and on the seaward side by the magnificent surf beach of Little Omaha Bay with its celebrated six kilometre sweep of white sand. The surf beach tapers off into a shifting sand bar at Te Taumutu Point at the northern end and there are rock ledges at the southern end.

The g roup planned to search the sandy flats of the Whangateau Harbour for the evidence of the bivalve, *Offadesma angasi..* Dead shells of *Offadesma angasi,* are often seen on the northern end of the beach near the harbour entrance. It is thought they originate from sand bars in the harbour and are were washed out of the Whangateau by the strong tidal flow. (The tidal flow at the entrance to the Harbour is 6 knots at the springs and 4 knots at the neaps.)

Saturday morning was fine and warm and our group set out by boat to explore the fore shore of low lying Horseshoe Island, located in the northern Whangateau Harbour. However, after several hours of searching, they failed to find any evidence of *Ofadesma angasi* in that region. It was it was in this locality that the *Nototodarus sloanii* was sighted. The group also recorded a large population of *Patiriella regularis* , the deep blue cushion stars, on the island's sandy flats.

Meanwhile, the writer who'd had adventures locating the Stace's house, missed the boat and spent most of Saturday morning collecting shells on the rock ledge and the beach at the southern end of Little Omaha Bay. In the evening we were joined by Jenny and Tony Enderby and some locals for a very enjoyable barbecue dinner.

Sunday by contrast was overcast and windy and rain was forecast for the afternoon. We spent the morning exploring the southern rock ledges and in the afternoon we collected on the surf beach until the rain set in .

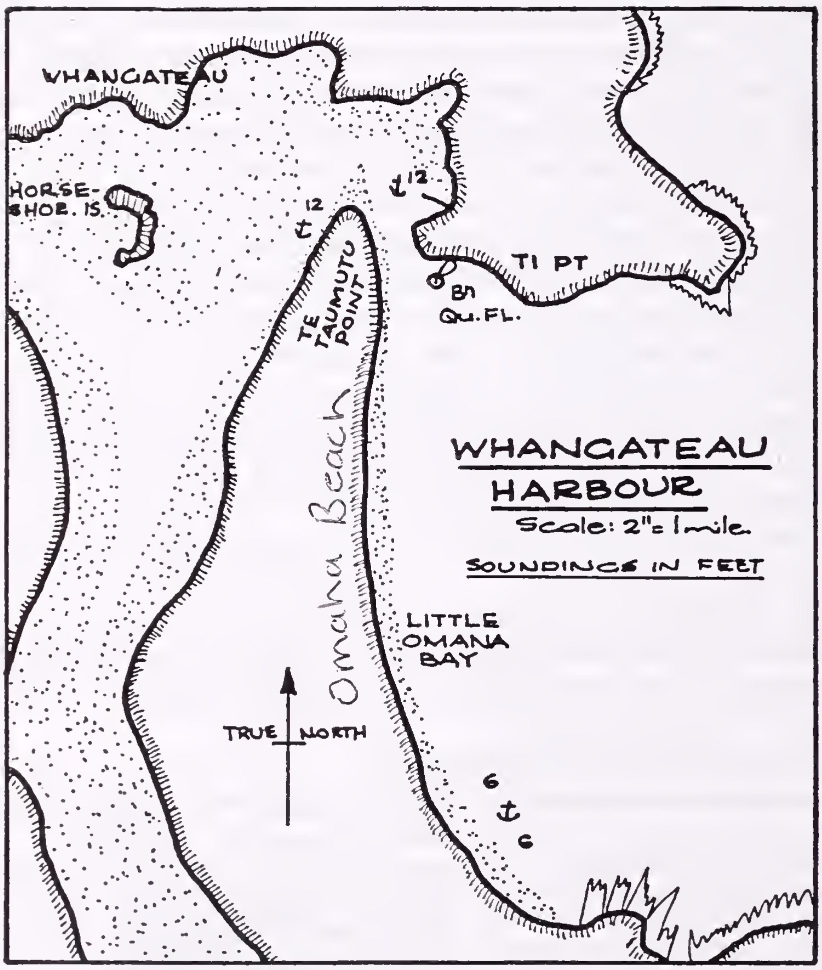
Shells sighted on Omaha Beach: Bivalves 29:

Anomia trigonopsis - golden oyster (half shell only)
Atrina Zelandica - horse mussel
Austrovenus stutchburyi - common cockle
Barnea similis - rock borer- half shell only
Barbatia novaezelandiae - ark shell
Chlamys zelandiae - fan shell-variety of colours
Divarilucina cumingi - lace shell
Dosinia anus - coarse dosinia
Dosinia subrosea - fine dosina
Gari lineolata - pink sunset shell -TeTaumutu Pt
Gari stangeri - purple sunset shell - TeTaumutu Pt.
Glycymeris modesta - small dog cockle
Macomona liliana - large wedge shell
Myadora striata - large battleaxe - half shell
Oxyperas elongata - long trough shell - half shell
Pecten novazelandias - queen scollop
Panopea zelandica - deep burrower - half shell
Paphies australis - pipi
Bassina yatei - frilled venus shell - half shell only
Paphies subtriangulata - tuatua
Perna canaliculus - green mussel
Ruditapes largillierti - oblong venus shell
Saccostrea glomerata - Auckland rock oyster
Spisula aequilatera - triangular trough shell
Tawera spissa - morning star -Te Taumutu Pt.
Tucetona laticostata - large dog cockle
Venericardia purpurata - purple cockle
Xenostrubus pulex - little black mussel

Gastropods 28:

Alcithoe arabica - volute
Bulla quoyii - brown bubble shell
Cabestana spengleri - Spengler's trumpet
Calliostoma pellucida - spotted tiger shell.
Cellana ornata - ornate limpet
Cellana radians - radiate limpet
Cominella adspersa - spotted welk.
Cookia sulcata - Cook's turban shell.
Charonia lampas - large trumpet
Dicathais orbita - white cask shell
Haliotis virginea - virgin paua
Haustrum haustorium - brown rock shell
Limaria orientalis - little file shell
Maoricolpus roseus - turret shell.
Maoricrypta costrata - ribbed slipper shell.
Maoricrypta monoxyia - smooth slipper shell
Modiolarca impacta - nesting mussel
Nerita atramentosa - black nerita
Pelicaria vermis - small ostrich foot.
Penion sulcata - northern siphon whelk
Sigapatella novaezelandiae - slipper shell.
Siphonaria australis - small siphon limpet
Struthiolaria papulosa - large ostrich foot.
Trochus tiaratus - tiara top shell
Haliotis iris - paua
Turbo smaragdus - cats eye.
Semicassis sp. - helmet shell
Zethalia zelandica - wheel shell.

OMAHA BEACH & WHANGAEAU HARBOUR - NTH. AUCKLAND



Sketch Map: ref. Royal Akarana Yacht Club *Coastal Cruising Handbook* 2nd. Ed.1974

Field trip to Wenderholm Regional Park Auckland.Sun.13th. July 03. 0.5 low tide 1235 hrs by R. A.Tyson

Members: Fiona Thompson, Leader. Bruce Hazelwood, Barb. and Wes. Bycroft Margaret Morley, Richard and Rosa Tyson.

A significant find of a rare murex *Morula chaidea* was made by Fiona Thompson on the southern rock ledge. Fiona has deposited this specimen in the Marine collection of the Auckland War Memorial Museum.

Wenderholm Regional Park is 48 km. north east of Auckland, on the southern shore of the Puhoi River. In 1965 Wenderholm became Auckland's first regional park. The park area affords interesting examples of coastal diversity: mud flats and mangroves on the tidal Puhoi River, salt marsh, a headland with rock ledges on the shoreline, coastal forest, a sand spit wih a surf beach about two kilometres long.The sand spit was formed by long shore drift (currents) carrying sand north,

The narrow entrance to the river is shallow but deepens inside and is navigable for several kilometres up stream for shallow draft boats only.

Wenderholm and the Puhoi River region were long settled by Maori because of abundant food resources. The first Europeans to settle in the area were from Bohemia. They arrived by ship at the mouth of the Puhoi River in June 1863.

The field trip was held on a superb, cloudless and windless mid - winter day. The sun shone warmly and the sea sparkled as our group spread out along the magnificent sandy beach towards the southern rock ledges.

Margaret set off along the rock ledges to Mahurangi Island, just south of the headland while Bruce hunted for land snails in bush by the main highway (and was pleasantly surprised with his sightings !)

<u>Wenderholm Regional Park - Perimeter Track by Bruce Hazelwood</u>
The park consists of a headland, sandy beach and swamp land. The vegetation is dominated by manuka and coprosma sp. The Perimeter Track circles the base of the headland - passing through regenerating bush, eg. manuka and coprosma sp. and flax into more unmodified bush - nikau and taraire, kohekohe, puriri, kaihikitea kawakawa and mahoe. I hope to complete a comprehensive survey of the park at a later date.

<u>Species of interest :</u>

1. *Phrixgnathus NSP* (cf. poecilosticta1.) - fat species. I have seen similar forms from Albert Dennis Res. Mahurangi East and Kaukapakapa.
2. *Phrixgnathus NSP* (cf. poecilosticta 2.) - narrow species. (may be a form of the previous species?) This has generally been known as*Phrixgnathus conicular* - how ever the type specimen comes from Hokianga and may be different to that species.
3. *Phrixgnathus* Sp. - I do not know this species!
4. *Paracharopa chrysaugea* - specimens display wider ribbing than usual.
5. *Climocella cavelliaformis* - recently described species by Jim Goulstone.
6. *Charopa Sp.* - I have not seen this before - one specimen - rough.
7. *Liarea hochstetteri, hochstetteri.* - This is a record at its southern limit. Its relative *Liarea hochstetteri, carinella* is found at its northern limit at Muriwai on the west coast .

<u>Introduced species of land snails 3 :</u>
Cantareus aspersa ,Oxychilus Sp. , Cochlicopa lubrica.

Native species of land snails 25 :

Cavellia roseveari
Cavellia buccinella
Charopa coma
"Charopa " NSP?
Mocella eta
Fectola mira? - infecta ?
Paracharopa chrysaugiea
Climocella cavelliaformis
Therasiella tamora
Therasiella decidua
Serpo kivi
Phenacohelix ziczag
Phenacohelix giveni
Flammulina perdita
Paraloama lateumbilicata
Punctid NSP
Punctid NSP
Laoma liemonias
Phrixgnathus NSP.
Phrixgnathus NSP.(cf. *poecilosticta* 1& 2. may be forms of the same species)
Phrixgnathus NSP. (cf. *poecilosticta* 2. may be the same species as above)
Phrixgnathus erigone
Phrixgnathus conella
Tornatelllnops novoseelandica
Liarea hochstetteri, hochstetteri.

List of species sighted by Fiona Thompson (F) mainly on the Southern rock ledge and by R. A. Tyson (R) on the surf beach.

Bivalves 30 :
Barnea similis (F) - rock borer
Austrovenus stutchburyi (R) - cockle
Bassina yatei (R) - frilled venus shell
Chlamys zelandiae (F&R) - fan scallop
Divarilucina cumingi (R) - lace shell
Diplodonta striatula (F)
Dosinia anus (F) - coarse dosinia
Dosinia crebra (F)
Dosinia subrosea (R) - fine dosina
Gari lineolata (R) - pink sunset shell
Felaniella zelandica (F)
Hiatella arctica (F) - wavy shell
Irus reflexus (F) - veneridae
Limaria orientalis (F) - fIle shell
Mactra discors (F) - large trough shell
Myadora striata (F) - battleaxe
Nucula hartvigiana (F) - triangle shell
Panopea zelandica (R) - burrower
Paphies australis (R) - pipi
Paphies subtriangulata (F&R) - tuatua
Pecten novaezelandiae (R) - scallop
Peronaea gaimardi (R) - angled wedge
Pholadidea suteri (F) - pick axe shape
Ruditapes largillierti (R) - oblong venus
Tawera spissa (R) - morning star shell
Tucetona laticostata (R) - dog cockle
Xenostrubus pulex (F) - black mussel
Zelithophaga truncata (F) - rock borer
Zenatia acinaces (R) - scimitar mactr

Gastropods 27 :
Amalda novaezelandiae (F&R)
Bulla quoyii (F&R) - brown bubble shell
Cantharidus opalus (F&R) - opal top
Cabestana spengleri (R) - trumpet
Crepidula costrata (F&R) - slipper shell
Cominella adspersa (F&R) - welk
Cominella virgata (F) - welk
Cookia sulcata (F&R) - turban shell
Diloma bicanaliculata (R) - top shell
Dicathais orbita (F&R) - cask shell
Haminoea zelandiae (R) - bubble
Haustrum haustorium(F&R)
Herpetopoma bella (F) - trochus shell
Maoricolpus roseus (F&R) - turret shell.
Melagraphia aethiops (F) - top shell
Morula chaidea (F) - rare murex
Murexsul octogonus (F) - murex
Nerita atramentosa (F&R) - black nerita
Paratrophon quoyi (F) - muricidae
Pelicaria vermis (F) - small ostrich foot
Sigapatella novaezelandiae (R)
Struthiolaria papulosa (F&R)
rochus viridis (R) - green top shell
Turbo smaragdos (F&R) - cats eye
Tugali elegans (F) - groved limpet
Xymene plebeius (F) - small murex
Zeacumantus subcarinatus (F)

Field trip Sulphur Beach
Sun.10th Aug 03 low 0.7 tide 1122 hrs. by R. A.Tyson

Members : Michael Bressolles, leader. Barb. Bycroft, Bruce Hazelwood, (Mr.) Chris. Horne, Heather Smith, Rosa Tyson.

Bruce Hazelwood made a significant find on the sand spit of a very large, dead *Alcithoe arabica* (harbour form) of 140 mm.

Sulphur Beach is located in the inner Auckland Harbour, (the Waitemata River) at the western entrance to Shoal Bay. The muddy beach runs parallel to the reclaimed land of the northern approaches of the Auckland Harbour Bridge. Access to the beach is via an under pass near the abandoned toll gate buildings.

Sulphur Beach, better known to Auckland's boating fraternity as the A.H.B's Northcote hauling out and deep water mooring area at Stokes Point, has a large car park, an excellent boat ramp and a number of dinghy lockers.

There were people at the beach when we arrived: a group of divers were busy salvaging the boom and mainsail from a sunken yacht while a fishing party expertly launched an open motor boat down the fully exposed, steep boat ramp.

Stokes Point is one of Michael's favourite fishing spots. Here the tidal flow at and above the Harbour Bridge run strongly at 3-4 knots at the spring tides but are weaker below the Bridge at about 2 knots at the springs.

On a fine day when the tide is full Stokes Point is a very scenic spot affording views of the Harbour Bridge, which spans the Waitemata from Stokes Point to Pt Erin (with a clearance of 43 metres under the main span) and Westhaven Marina and the Auckland City's Central Business District on the southern shore.

Sulphur Beach is remarkable for an adjacent sand spit which extends out across Shoal bay towards the Bayswater Marina, situated on its eastern shore. The furthest limits of the sand spit are clearly marked by the red can Bayswater Beacon.

The shore line of Shoal Bay to the north of the sand spit is City of Cork Beach, famous for its population of dotterels which in every spring nest resolutely on raised shell banks oblivious to the roar of the motorway traffic close by.

The morning sky was overcast and a brisk, easterly wind was blowing. We arrived at 11am and walked out to the sand spit. The beach, although muddy and uninviting, did not appear polluted considering the storm water outfall at Stokes Pt. We were encouraged to see abundant numbers of live animals such as *Haminoea zelandiae*.

Michael had previously seen numbers of dead *Alcithoe arabica* (harbour form) on the sand spit and surmised that the volutes probably originated down harbour and were carried to the sand spit by the strong tidal flow.

At low tide the exposed sand spit was an ossuary of strewn volutes. The shells were aged and very bleached but most were intact. We gathered bags of the volutes and later tipped the shells onto the beach and compared them for size.

The general consensus regarding Michael's theory was that some of the volutes may also originate in Shoal Bay and that we should investigate the eastern shoreline of the bay at a later date.

It was an enjoyable field trip (despite the writer making an involuntary crawl through soft mud !) The beach was relatively clean of waste plastic etc. but there were some interesting items of jetsam: several whole coconuts wrapped in rags and one member went home with a builder's plank.

List of species sighted at Sulphur Beach.

Bivalves 11:

Anomia trigonopsis- - golden oyster - half shell only
Atrina zelandica - horse mussel - half shell
Austrovenus stutchburyi - common cockle (most abundant shell)
Crassostrea gigas - Pacific oyster - many alive
Cyclomactra ovata - oval trough shell
Gari stangeri - purple sunset shell (double)
Macomona liliana - large wedge shell (many doubles)
Paphies australis - pipi.
Pecten novaezelandiae - queen scallop - half shells
Saccostrea glomerata - Auckland rock oyster
Soletellina nitida - sunset shell (harbour form)

Gastropods15 :

Amalda australis - a pristine blue form (inhabited by a hermit crab)
Alcithoe arabica - volute, the harbour form with usually 7 knobs on the body whorl
Amphibola crenata - mud snail
Bulla quoyii - brown bubble shell
Cominella adspersa - spotted whelk - many alive
Cominella glandiformis - mud whelk
Haminoea zelandiae - white bubble shell - many alive
Nerita atramentosa - black nerita.
Pelicaria vermis - small ostrich foot.
Penion sulcata - Northern siphon whelk
Turbo smaragdus - cats eye.
Zeacumantus lutulentus - mudflat creeper - many alive
Zeacumantus subcarinatus - mud creeper - many alive
Onchidella nigricans - many alive
Bursatella leachii - seahare, many alive on the mud

Land molluscs: 10 land snails sighted by Bruce Hazelwood. R11/665851

The bank adjacent to the sand spit was dominated by small pohutukawa and the ubiquitous *Zebrina pendula* ,`wandering Jew'. I sighted ten species of land snails :

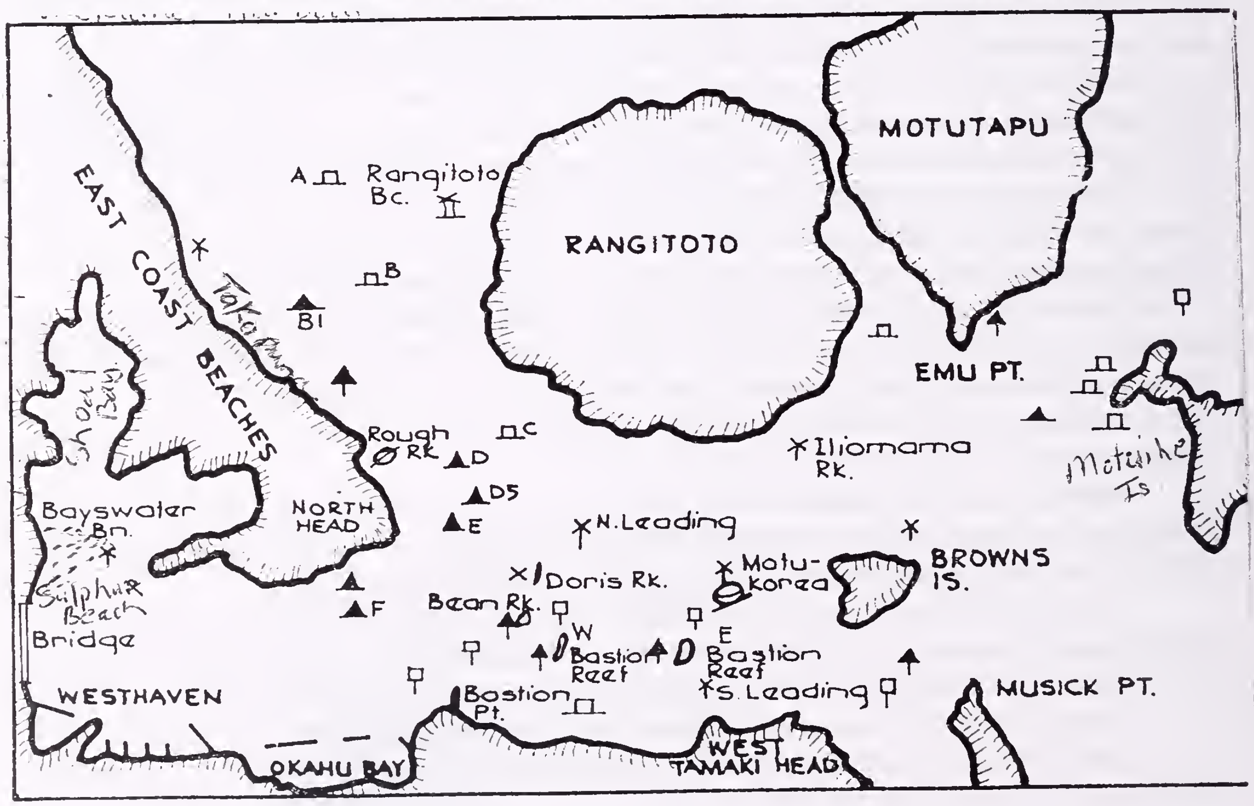
Introduced species 4 :

Cochlicopa lubrica
Helicodiscus singleyanus
Lauria cylindracea
Oxychilus cellarius

Native species 6 :

"Charopa " parva
Mocella eta (Subfectola caputspinulae (non Reeve) ref Powell NZM.1979 pg.309)
Phrixgnathus NSP
Paralaoma lateumbilicata
Tornatellides subperforata
Tornatellinops novoseelandica

SULPHUR BEACH & SANDSPIT - AUCKLAND HARBOUR



Sketch Map: ref. Royal Akarana Yacht Club *Coastal Cruising Handbook* 2nd. Ed.1974

Field trip to Karaka Bay and Glendowie Sandspit Sat. 27th. Sept, 2003. 0.3 m. low tide at 1354 hrs. compiled by R. A. Tyson

Members: Margaret Morley, Bruce Hazelwood, Michael Bressolles, Rosa Tyson

Karaka Bay beneath West Tamaki Head is a shallow bay on the Western shore of the lower reaches of the Tamaki River, Auckland Harbour. The bay has a short, sandy beach with a line of houses nestling under high sandstone cliffs. Beach access is via a winding path down the steep cliff face. The cliffs are draped mainly with ancient *Metrosideros excelsa* , lush green *Macropiper excelsum* , exotic palms.and a grove of tall bamboo.

This idyllic bay, about 10 km. from the centre of Auckland, is now situated in an exclusive housing area. In 1840 the Treaty of Waitangi was signed on the beach by local Maori Chiefs and a memorial fountain inscribed with their names is located by the path to the beach.

The visitor to the bay first encounters a row of highly individual letter boxes at the top of the pathway located at the end of Peacock Road. (The sight of such personalised letter boxes never fails to arouse the attention of the Urban Anthropologist lurking within.) Indeed, so curious are Aucklanders about the residents of Karaka Bay that, whenever the tranquillity of the tiny community has been disrupted by neighbourhood disputes i.e. the resident who liked to take a morning stroll along the beach - accompanied by his two pet pigs or the saga of the hapless resident who hired a helicopter to drop off building supplies - which shook the crop of almost-ripe peaches off his neighbour's tree, were deemed newsworthy events and widely reported in Auckland newspapers !

Rain was falling lightly when we arrived on the beach. The turbulent westerly wind of the previous week had died away and the waters of the eastern harbour were calm and shrouded in mists. The beach usually affords a splendid view of Brown's Island (Motukorea), the volcano at the mouth of the Tamaki River and Musick Point on the eastern headland. However, today visibility was so diminished that the Island seemed to hover like a ghost mountain above the water.

An extensive rock ledge is situated at the northern end of the beach and there are rocky outcrops at its southern end. Beyond these rocks are sandy deposits which extend from Karaka Bay up river to the Glendowie Sand spit.

evocative first impressions recorded by An early owner of Brown's Island, Sir John Logan Campbell, recorded his first impressions of Karaka Bay and Brown's Island in the mouth of the Tamaki: in his book *Poenamo* . On a fine day in 1840 he sailed down harbour and sighted ...`A sheet of water lay stretched before them about fourteen miles long by about six broad. From the travellers' point of view it was landlocked. Here and there openings could be seen, but more distant land filled up the background. These passages appeared to wander around little islands, creating a desire to be able to explore them all. At the Western extremity of the inlet one of these little islands lay in mid channel. The most picturesque of little rounded mountains reared itself, as if guarding the passage, and, proud of its own beauty, was not in the least ashamed that it lay in the fairway, and blocked up the centre of the passage and the view beyond. The right hand shore of the inlet rose steeply from the water's edge, save here and there where little bays broke into the continuity of the coastline. In these indentations - hardly to be termed bays- there always could be seen a little plateau of land stretching from the shore to the base of the hills, (the cliffs) which then rose abruptly. The eye rested with delight on the evergreen foliage of primeval forest... The boat meanwhile ...gradually drew mid stream, and the opposite shore (Musick Point) became more distinct. It was not nearly so beautiful as that on the right hand : it was destitute of forest ... and at its head, the land being low, the eye failed to detect where the waters ended and land commenced. Fatigued with the search the eye ran along the gradually - rising high land, which ended in a bold headland just opposite the little island.This promontory showed a face of yellow sandstone, and at its extremity was crowned by a magnificent clump of

trees, while smaller shrubs hung over the edge of the cliff, the green foliage thrown into startling relief by the yellow back-ground. As you gazed on this plumed headland of exquiste beauty you now and again laboured under the optical illusion that it was moving ...and half feared, if you took your eye away, the next time you looked at the headland-plume and all - would have thrown itself into the arms of the little island's mountains and hidden all its beauties in the shadow of that mountain's bosom."

On close inspection the gentle sweep of beach at Karaka Bay was covered with fine gravel and a sprinkling of sand with an overlay of pretty blue cockle shells. The beach was very clean and bordered by neat lawns.

A large numbers of *Cominella glandiformis* were scattered over the beach feasting on cockles. A large starfish, *Astropecten polyacanthus,* was sighted with a cluster of cockles in its arms and Michael made the bizarre sighting of a detached arm of a starfish and clutching at a cockle!. A few specimens of the orange coloured cushion star, *Patiriella regularis* were also laying on the mud.

List of 20 live species sighted by Margaret Morley:

**Bursetella leachii.* - Several very large specimens, one 150 mm. in length, were crawling in low tidal pools in sea grass. The soft, shell-less animal is olive-green with scattered dark blotches and a double row of 8 -12 emerald spots. The body is covered with many single and branched dendritic processes. It feeds on filamentous algae. When disturbed it emits purple "ink" .

Acanthochitona zelandica
Alloiodoris langinata - a nudibranch
Atrina zelandica
Austrovenus stutchburyi
Bulla quoyii
Bursatella leachii - Hairy sea hare *
Chiton glaucus
Cominella adspersa
Cominella glandiformis
Cominella virgata
Crassostrea gigas
Dendrodoris citrina - orange nudibranch
Ischnochiton maorianus
Maoricrypta monoxyla
Melanochlamys cylindrica - black slug type
Onchidella nigricans
Perna canaliculus
Pleurobranchaea maculata - spawn
Turbo smaragdus
Xenostrobus pulex

List of 23 dead species sighted by Margaret Morley and R. A. Tyson :

Amalda novazelandiae (R) - olive
Amphibola crenata (R) - mud snail
Atrina zelandica (R) - horse mussel
Austrovenus stutchburyi (R)- N.Z. cockle
Crassostrea gigas (R) - Pacific oyster
Cominella adspersa (R) - speckled whelk
Cominela glandiformis (R) - small whelk
Cominella maculata (M&R) - speckled whelk
Cominella virgata (R) - red mouthed whelk
Cyclomactra ovata (M) - large oval shell
Maoricolpus roseus (R) - turret shell
Macomona liliana (M&R) - wedge shell
Melagraphia aethiops (R) - dark top shell
Modiolarca impacta (R) - nesting mussel
Ophicardelus costellaris (R) - banded ear shell
Paphies australis (R) - pipi
Pelicaria vermis (M&R) - small ostrich foot
Penion sulcata (R) - Northern siphon whelk
Perna canaliculus (R) - green mussel
Saccostrea cucullata (R) - rock oyster
Turbo smaragdus (R) - cats eye
Purpurocardia purpurata (R) - purple cockle
Xenostrobus pulex (R) - small mussel

The list of land snails collected by Bruce Hazelwood beneath the native species kawakawa, mahoe, pohutukawa and taupata, by the path from the end of Peacock Street to the beach at Karaka Bay. (R11/777817 BFH 27/9/2003)

Introduced species 2 :

Cochlicopa lubrica Oxychilus sp. (*cellarius* ?)

Native species 6 :

Mocella eta (Subfectola caputspinulae (non Reeve) , *Paralaoma lateumbilicata* ,*Paraloama caputspinulae* *Punctid* NSP (sp. 2000 - *Punctid* NSP 140) (common),*Tornatellinops novoseelandica* *Tornatellides subperforata*

The Glendowie Sand Spit:

Tahuna-Torea Nature Reserve, the `gathering place of the oystercatcher' is about 4 km. south of Karaka Bay. The reserve is a 25ha wilderness area of mangrove lagoon, swamp land, bordered by mud flats and the sand spit. The whole area is surprisingly clean of glass and plastic deposits. The expansive sand spit and mud flats were formed by deposits of eroded sandstone, shells and volcanic ash washed into the river over time. Nowadays the beach on the sand spit extends for

1.5 km. At low tide about 100 metres of water separates the end of the spit and Bucklands Beach. Bruce and Michael went in search of volutes on the sand spit. They found many dead and aged *Alcithoe arabica* . (harbour form) Some of the volutes were large but no small specimens were found and many were inhabited by crabs and the chitons *Acanthochitona zelandica* and *Ischnochiton maorianus*.

I walked out to the end of the spit. (my husband Richard often leaves his trailer yacht at the Marina and we sail tantalisingly close to the sand spit but never land on it.) Near the end of the spit I was rewarded with the sight of wide beds of ancient *Cyclomactra ovata* . The huge shells are half buried and stand close together as in life. Brittle to the touch, all are gaping open and full of mud.

<u>Species sighted on the mud flats and sand spit.</u>

<u>Bivalves 8 :</u>

Atrina zelandica - horse mussel.
Cyclomactra ovata - oval trough shell
Austrovenus stutchburyi - common cockle
Dosinia anus - coarse dosinia
Macomona liliana - large wedge shell
Paphies australis - pipi
Pecten novaezelandiae - queen scallop
Perna canaliculus - green mussel

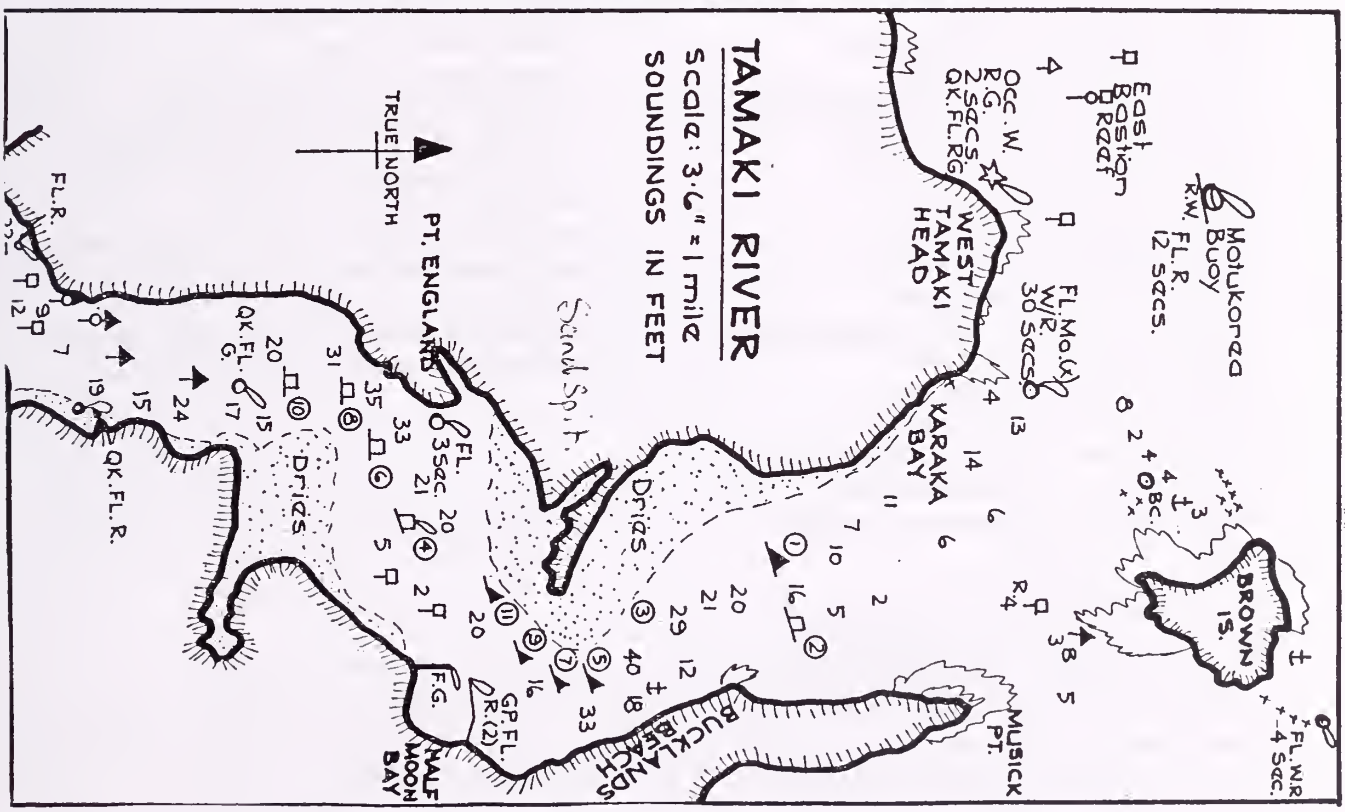
<u>Gastropods 16 :</u>

Alcithoe arabica - volute harbour form
Amphibola crenata - mud snail
Austrofusus glans - knobbed whelk
Cominella adspersa - spotted whelk
Cominella glandiformis - small mud whelk
Cominella maculata - slender mud whelk
Diloma subrostrata - mudflat top shell
Maoricolpus roseus - turret shell
Melagraphia aethiops - dark spotted top shell
Penion sulcata - Northern siphon whelk
Struthiolaria papulosa - large ostrich foot.
Pelicaria vermis - small ostrich foot
Trochus tiaratus- tiara top shell
Xymene plebeius - small murex
Zeacumantus lutulentus- - a horn shell
Turbo smaragdus - cat's eye

<u>Lve species 5</u>:

Acanthochitona zelandica - chiton
Cominella adspersa - spotted whelk
Cominella glandiformis - small mud whelk
Cominella maculata - slender mud whelk
Ischnochiton maorianus - chiton

TAMAKI RIVER - KARAKA BAY- GLENDOWIE SAND SPIT



Sketch map ref. Royal Akarana Yacht Club *Coastal Cruising Handbook* 2nd Ed. 1974

Field trip to Takapuna Beach Auckland Sun. 12 th. October 2003

Low tide 0.6 at 1532 hrs.

by R. A. Tyson

Members: Richard and Rosa Tyson.

Takapuna Beach is located on the eastern side of the small peninsula that forms the northern head of the Waitemata River (the inner Auckland Harbour.) It is an interesting location as only one kilometre of land separates Takapuna Beach from Shoal Bay (Sulphur Beach) situated on the western shores of the peninsula.

On the seaward side of Takapuna Beach lies the northwest entrance to the Rangitoto Channel, the Port of Auckland's main shipping lane. The eastern side of this channel is bordered by the rugged fore shore of Rangitoto Island, (259 m.) a young volcano which emerged from the waters of the Hauraki gulf c.600 years ago.

Takapuna's sandy beach forms a generous sweep of a bay about one and a half kilometres long. There is deep water close inshore and the bay has a firm, sandy bottom. The beach is terminated at each end with rock ledges overhung with high cliffs. The northern ledge extends 274 metres offshore and is well marked.

The beach is a popular city recreational bathing and boating spot and affords splendid views of the outer islands of the Hauraki Gulf and Rangitoto Lighthouse, a tall red and white concrete tower situated at Mackenzie Bay.

Weather permitting, at least three lines of breakers form in the bay, transforming the suburban beach into a haven for Auckland's surfing fraternity.

The close proximity of the Takapuna beach, with its extensive rock ledges, to Auckland city has enabled it to be comprehensively studied over the years.

list of species found dead on the beach:

Bivalves. 24 species:

Anomia trigonopsis - golden oyster
Atrina zelandica - horse mussel
Austrovenus stutchburyi - common cockle
Barbatia novaezelandiae - ark shell
Barnea similis - angel wing rock borer
Bassina yatei - frilled venus shell
Chlamys zelandiae - fan shell
Crassostrea gigas - Pacific oyster
Divarilucina cumingi - lace shell
Dosinia anus - biscuit coloured ringed dosinia
Dosinia subrosea - fine dosinia
Gari lineolata - pink sunset shell
Gari stangeri - purple sunset shell
Limaria orientalis - transparent little file shell
Macomona liliana - large wedge shell
Myadora striata - large myadora or battleaxe
Paphies australis - pipi.
Paphies subtriangulata - tuatua
Pecten novaezelandiae - queen scallop
Perna canaliculus - green mussel
Ruditapes largillierti - oblong venus shell
Saccostrea glomerata - Auckland rock oyster
Tawera spissa - morning star
Tucetona laticostata - large dog cockle

Gastropods. 11 species:

Cellana radians - limpet
Cominella adspersa - speckled whelk
Cookia sulcata - Cook's turban shell.
Crepidula costrata - ribbed slipper shell.
Haustrum haustorium - brown rock shell
Maoricolpus roseus - turret shell
Maoricrypta monoxyia - smooth slipper shell
Melagraphia aethiops - dark top shell
Penion sulcata - Northern siphon whelk
Sigapatella novaezelandiae - slipper shell.
Struthiolaria papulosa - large ostrich foot

Publication Summaries

by Peter Poortman

This article contains brief summaries of a selection of molluscan papers that have been published in recent years. Copies of the original publications are held in the club library, or can be obtained from the author of the paper.

Title:	**A review of the Recent Trochini of New Zealand (Mollusca: Gastropoda: Trochidae)**
Publication:	***Molluscan Research 19(1): 73-106 (1998)***
Author:	**Bruce A. Marshall, Museum of New Zealand Te Papa Tongarewa**
Date:	**1998**

New Zealand Recent Trochini are revised, illustrated and keyed.

A new subgenus of *Trochus* (*Camelotrochus*) is introduced for *Trochus camelophorus* Webster, 1906.

Eleven species are recognised, including the following four new species:
- *Thoristella rex* – Shell up to 5 mm wide. Distribution off Three Kings Islands, 102-440 m.
- *Thoristella davegibbsi* – Shell up to 6.9 mm wide. Distribution off Three Kings Islands, Cape Reinga, and Poor Knights Islands, 4-128 m on rocky ground.
- *Thoristella polychroma* – Shell up to 5.95 mm wide. Distribution off Three Kings Islands and north of Cape Reinga, 14-88 m.
- *Thoristella carinata* – Shell up to 5.75 mm wide. Distribution off Three Kings Islands and Rungapapa Knoll, Bay of Plenty, 14-228 m.

The following taxa are newly synonymised with *Thoristella chathamensis* (Hutton, 1873):
- *Trochus oppressus dunedinensis* Suter, 1897
- *Calliostoma aucklandicum* E.A. Smith, 1902
- *Thoristella chathamensis cookiana* Powell, 1934

Trochus carmesina Webster, 1908 is transferred from *Talopena* to *Thoristella*, and *Thoristella fossilis* Finlay, 1926 is transferred to *Trochus* (*Coelotrochus*).

Lectotypes (i.e., specimens nominated as the type) are designated for the following taxa:
- *Trochus tiaratus* Quoy and Gaimard, 1834
- *Trochus viridis* Gmelin, 1791
- *Polydonta viridescens* A. Adams, 1853
- *Polydonta elegans* Gray, 1835
- *Polydonta tuberculata* Gray, 1843
- *Trochus fulvolabris* Hombron and Jacquinot, 1854
- *Calliostoma aucklandicum* E.A. Smith, 1902

Title:	**The New Zealand, Recent species of *Cantharidus* Montfort, 1810 and *Micrelenchus* Finlay, 1926 (Mollusca: Gastropoda: Trochidae)**
Publication:	***Molluscan Research 19(1): 107-156 (1998)***
Author:	**Bruce A. Marshall, Museum of New Zealand Te Papa Tongarewa**
Date:	**1998**

The New Zealand Recent species of *Cantharidus* (3 species) and *Micrelenchus* (10 species) are revised, illustrated and keyed.

A new subgenus of *Cantharidus* (*Mawhero*) is introduced for *Cantharidus purpureus* (Gmelin, 1791), and *Plumbelenchus* is interpreted as a subgenus of *Micrelenchus* and 7 species are newly transferred there.

The following new species are described from north of Cape Reinga.

- *Cantharidus (Mawhero) burchorum* – Shell 20.5-27.5 high at maturity. Distribution off Three Kings Islands, Middlesex Bank and King Bank, northern NZ, 7-805 m.
- *Micrelenchus (Plumbelenchus) festivus* – Shell up to 6.2 mm high. Distribution off Three Kings Islands and off Cape Reinga, 13-88 m.

Micrelenchus huttonii (Smith, 1876) is resurrected from synonymy under *Micrelenchus tenebrosus* (A. Adams, 1853).

The following seven taxa are newly synonymised:

- *Cantharidus opalus cannoni* Powell, 1933 with *C. opalus* Martyn, 1784)
- *Cantharidus coruscans* Hedley, 1916 with *M. capillaceus* (Philippi, 1848)
- *Cantharidus sanguineus elongatus* Suter, 1897, *Gibbula micans* Suter, 1897 and *M. sanguineus bakeri* Fleming, 1948 with *Canthiridus artizona* A. Adams, 1853
- *M. oliveri cryptus* Powell, 1946 with *M. sanguineus* (Gray, 1843)
- *M. parcipictus* Powell, 1946 with *M. tenebrosus* (A. Adams, 1853)
- *M. caelatus morioria* Powell, 1933 and *M. caelatus archibenthicola* Dell, 1956 with *M. mortenseni* (Odhner, 1924)

Lectotypes (i.e., specimens nominated as the type) are designated for the following taxa:

- *Canthiridus tenebrosus* A. Adams, 1853
- *Trochus (Canthiridus) huttonii* Smith, 1876
- *Canthiridus zealandicus* A. Adams, 1853
- *Cantharidus pruninus minor* Smith, 1902
- *Photinula coruscans* Hedley, 1916
- *Canthiridus artizona* A. Adams, 1853
- *Canthiridus rufozona* A. Adams, 1853
- *Cantharidus sanguineus caelatus* Hutton, 1884
- *Gibbula mortenseni* Odhner, 1924

Neotypes are designated for the following taxa:

- *Limax opalus* Martyn, 1784, *Trochus iris* Gmelin, 1791 and *Trochus acuminatus* Perry, 1811 (= *Cantharidus opalus*)
- *Helix purpurea* Gmelin, 1791, *Trochus rostratus* Gmelin, 1791 and *Trochus elegans* Gmelin, 1791 (= *Cantharidus purpureus*)
- *Gibbula plumbea* Hutton, 1878 (= *Micrelenchus huttonii*)

Title:	**A Revision of the Recent Solariellinae (Gastropoda: Trochoidea) of the New Zealand Region**
Publication:	***THE NAUTILUS 113(1): 4-42, 1999***
Author:	**Bruce A. Marshall, Museum of New Zealand Te Papa Tongarewa**
Date:	**1999**

Twenty-nine species (17 new) of Solariellinae are recorded from the Norfolk Ridge, Three Kings Rise, Kermadec Ridge, and New Zealand.
The species are referred to:

- *Solariella* Wood, 1842 (10 species, 4 of which are new)
- *Bathymophila* Dall, 1881 (3 new)
- *Microgaza* Dall, 1881 (1 new)
- *Archiminolia* Iredale, 1929 (10, 6 new)
- *Zetela* Finlay, 1926 (5, 3 new)

Zeminolia Finlay, 1926, is treated as a synonym of *Solariella.*

Bathymophila Dall, 1881, is transferred from Margaritinae to Solariellinae on the basis of radular morphology.

Ethaliopsis Schepman, 1908, is synonymized with *Bathymophila*, the shell of a paralectotype of *Solariella (Ethaliopsis) callomphala* Schepman, 1908, is illustrated, and a lectotype (i.e., specimen nominated as the type) is designated for the species.

Lamellitrochus Quinn, 1991; (based on a western Atlantic species), is regarded as a probable synonym of *Zetela*, and the southern African species *Solariella intermissa* Thiele, 1925, and the North Atlantic species *Trochus (Margarita) rhina* Watson, 1886 (= *Solariella cincta sensu* Dautzenberg and Fischer, 1896, and Dautzenberg, 1927, not Philippi, 1836) are referred to *Zetela*.

Title:	**A Revision of the Recent Species of *Eudolium* Dall, 1889 (Gastropoda: Tonnoidea)**
Publication:	***THE NAUTILUS 106(1): 24-38, 1992***
Author:	**Bruce A. Marshall, Museum of New Zealand Te Papa Tongarewa**
Date:	**1992**

This paper was the result of an attempt to identify two species of the genus *Eudolium* Dall, 1889 recently obtained off New Zealand. At that time, the taxonomy of the Tonnidae family was poorly understood.
This work synonymised five former species that had been assigned to *Eudolium*, and determined that there are just three distinct Recent species of *Eudolium* worldwide.
The paper also contains an interesting discussion on the worldwide transport and distribution of the three *Eudolium* species.

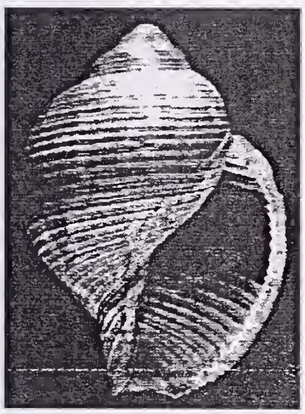


Fig 1: *Eudolium crosseanum* off Sicily (79.8 x 58 mm).

Fig 2: *Eudolium pyriforme* off Taiwan (84.5 x 55 mm).

Fig 3: *Eudolium bairdii* off N.Z. (76 x 49.5 mm).

Eudolium crosseanum **(Monterosato, 1869)**
Shell up to 81 mm high, thin to moderately thick, periostracum thin, straw coloured. Protoconch deep yellowish brown on a white or buff white ground, some major spiral cords with small yellowish brown spots, mature outer lip typically with a pinkish flush. Found at depths of 17-914 m in the Mediterranean and Western Atlantic.

Eudolium pyriforme **(Sowerby, 1914)**
Shell up to 85.5 mm high, thin. Periostracum thin, translucent, straw coloured. Protoconch yellowish brown; teleoconch sparsely to densely irregularly maculated with pale to deep yellowish brown, major spiral cords alternately spotted yellowish brown and white on a buff white ground, outer lip of many specimens with a pinkish flush.

Eudolium bairdii **(Verrill & Smith, 1881)**
Shell up to 76 mm high, thin to rather thick, periostracum thin, straw coloured. Protoconch deep yellowish to reddish brown; teleoconch white or buff white, major spiral cords yellowish to reddish brown, outer lip white.

Title: **New Species and Records of Deep-Water Mollusca from off New Zealand**
Publication: ***Tuhinga: Records of the Museum of New Zealand Te Papa Tongarewa - No. 2, pp. 1-26, 38 figs (1995)***
Author: **R.K. Dell, Museum of New Zealand Te Papa Tongarewa**
Date: **1995**

Some deep-water Mollusca collected from off New Zealand by the USNS Eltanin were sent to Dr. Dell for identification and description. Some of the more striking of these, together with species collected during field work by the Museum of New Zealand and the New Zealand Oceanographic Institute, are described and recorded in this paper.

The following new species are described:

- *Adipicola arcuatilis* (Fig. 1: 29.2 x 7.8 mm)
- *Lyonsiella aotearoa* (Fig. 2: 6.5 x 5.0 mm)
- *Poromya microsculpta* (Fig. 3: 16.2 x 12.2 mm)
- *Antimargarita maoria* (Fig. 4: 13.5 x 14.7 mm)
- *Antarctodomus powelli* (Fig. 5: 34.7 x 20.6 mm)
- *Acharax clarificata* (Fig. 6: 87.7 x 32.7 mm)

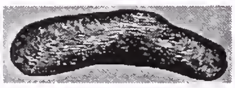


Fig. 1

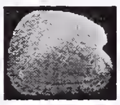


Fig. 2

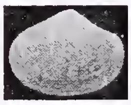


Fig. 3

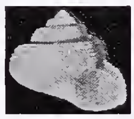


Fig. 4


Fig. 5

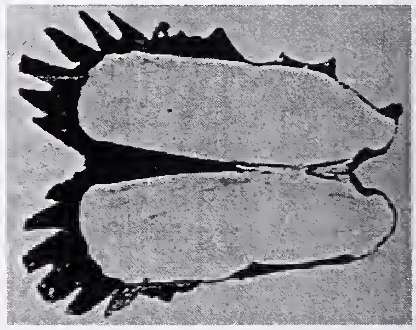


Fig. 6

New distribution records are given for:

- *Galeodea triganceae* Dell, 1953
- *Volutomitra banksi* (Dell, 1951)
- *Latiromitra problematica* (Ponder, 1968) (Fig. 9: 44.5 x 13.7 mm)


Fig. 7

The subspecies *Penion benthicolus delli* Powell, 1971 is synonymised with *Penion benthicolus Dell, 1956* (Fig. 10: 107.8 x 44.3 mm, 58.5 x 24.7 mm, 96.7 x 35.3 mm)

Boreotrophon shirleyi is transferred to the family Turbinellidae and placed in *Metzgeria* as *Metzgeria shirleyi* (Cernohorsky, 1980) (fig. 11: 50.3 x 22.6 mm)

Poromya undosa Hedley and Petterd, 1906 (described from off New South Wales) (Fig. 7: 5.8 x 5.0 mm), and *Claviscala kuroharai* Kuroda in Habe, 1961 (described from off Japan) (Fig. 8: 83.0 x 22.4 mm, 57.8 x 13.9 mm) are recorded from New Zealand.


Fig. 8

The supposed scaphopod *Dentalium tiwhana* Dell, 1953 is transferred to the Polychaeta.

Fig. 9

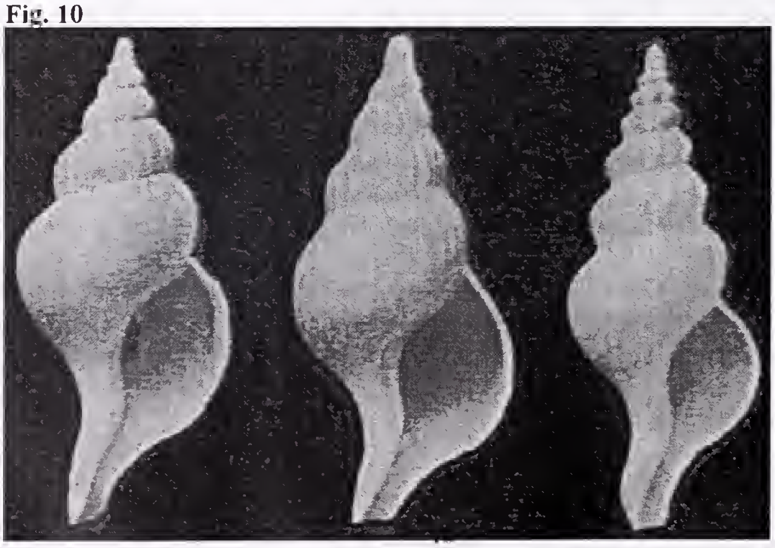

Fig. 10


Fig. 11